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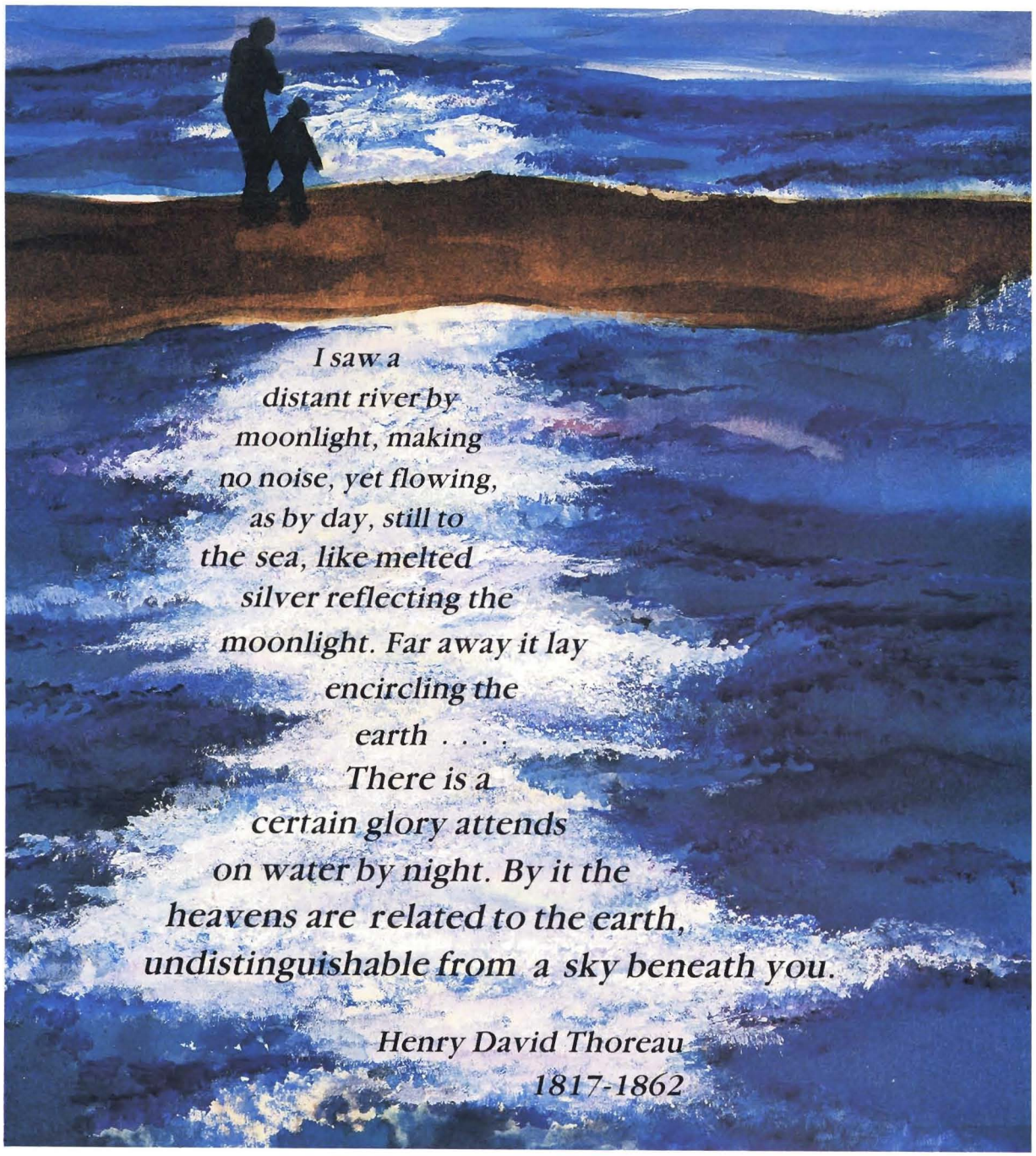

FLUORINE: A TRACE ELEMENT ESSENTIAL TO LIFE

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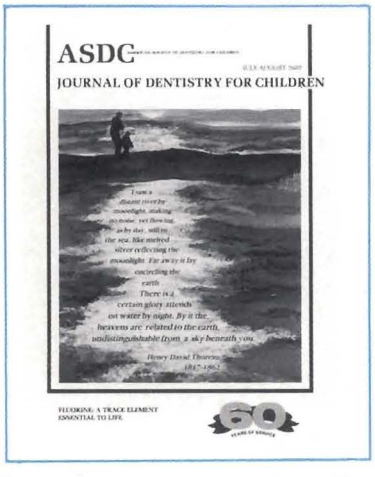
ASDC AMERICAN SOCIETY OF DENTISTRY FOR CHILDREN

JOURNAL OF DENTISTRY FOR CHILDREN

Volume 54 Number 4 July-August 1987



Water is the most important element for sustenance of life. At the same time it provides a beauty unsurpassed, in the form of rivers, lakes, oceans, and waterfalls. Design and art by Sharlene Nowak.

FLUORIDE

EPIDEMIOLOGY

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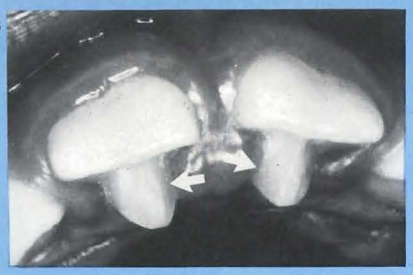

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CLINIC

NUTRITION

CASE REPORTS

For the busy reader

A three-year clinical comparison of a sodium monoflurophosphate dentifrice with sodium fluoride dentifrices on dental caries in children – page 241

This study compared the anticaries effects of these three fluoride-containing dentifrices: 1100 ppm F as NaF (positive control); 2800 ppm F as SMFP; and 2800 ppm F as NaF. The group using the 2800 SMFP dentifrice showed no significant differences in DMFS or DMFT, compared to the positive control, at anytime during the study. This indicated that higher levels of sodium monoflurophosphate in a dentifrice offer no advantage in caries protection over the conventional level of sodium fluoride, 1100 ppm F.

Requests for reprints should be directed to Dr. K. H. Lu, Oregon Health Sciences University, 611 S.W. Campus Drive, Portland, OR 97201.

Frequency of undesirable side-effects following professionally applied topical fluoride – page 245

Of a total of 149 questionnaires distributed to parents, ninety-one were completed and returned (61.1 percent). Overall, six children reported side-effects, including nausea and vomiting, either immediately or within one hour following treatment. Age and weight were not factors in experiencing side-effects.

Requests for reprints should be directed to Dr. L. K. Rubenstein, Box 566, MCV Station, Richmond, VA 23298.

Increasing use of dental services by very young children – page 248

The increasing use of dental services by very young children is part of the generally improving outlook for pediatric dentists, and is due in part to a generally changing awareness of the value and use of health services. Many traditional use patterns for different racial groups persist.

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.

The relationship between the intake frequency and the total consumption of sucrose among four South African ethnic groups – page 251

Frequency of intake of sucrose and its total consumption have been implicated as major causative factors in the pathogenesis of dental caries. In the absence of contrary information, it seems that the figure of five sugar exposures per day is a prudent one for the practitioner to recommend to young patients.

Requests for reprints should be directed to Professor P. Cleaton-Jones, Dental Research Institute, University of the Witwatersrand, 1 Jan Smuts Avenue, Johannesburg 2001, RSA.

The effects of spastic cerebral palsy on occlusion- – page 255.

This research paper compares dental casts and lateral cephalometric radiographs of thirty children with spastic cerebral palsy with those of a control group to determine what effect spasticity and cerebral palsy have on dental occlusion and skeletal formation. Muscle spasticity can retard bone growth. Variations in the normal tonus of head and neck muscles can cause malocclusion and arch deformity.

Requests for reprints should be directed to Dr. Betty Jane Strodel, 7608 Mary Knoll Road, Bethesda, MD 20817.

The effects of indomethacin on resorption and ankylosis in replanted teeth – page 261

Indomethacin, a nonsteroidal, antiinflammatory analgesic, interferes with the action of prostaglandin synthetase such that osteoclastic activity is reduced. Encouraging results were obtained, pointing toward an

improved long-term prognosis for replanted teeth, and as a possible solution to excessive root resorption.

Requests for reprints should be directed to Dr. John S. Walsh, Department of Child Dental Health, University of Dublin, Lincoln Place, Dublin 2, Ireland.

Diagnosis of developmental dental anomalies using panoramic radiographs – page 267

Early detection and diagnosis require medical and dental histories, clinical examination, and radiographs. The panoramic radiograph will yield more accurate results in children older than eight to nine years, when most tooth buds should be discernible.

Requests for reprints should be directed to Dr. Raphael Pilo, Department of Oral Rehabilitation, School of Dental Medicine, Tel Aviv University, Ramat Aviv 69978, Tel Aviv, Israel.

Lymphangiomas of the alveolar ridge in a neonate: report of case – page 277

Lesions occur on the maxillary and mandibular posterior dental ridges. A case is described in which a thirteen- day-old black male had two such lesions, approximately 5mm in diameter.

Requests for reprints should be directed to LTC Paul E. Kittle, Chief, Pediatric Dentistry, U.S. Army DENTAC, Ft. Leavenworth, KS 66027-5410.

Lymphangioma of the tongue: report of case – page 280

Extensive lymphangiomic lesions may cause gross deformities of the tongue, which may interfere with speech and swallowing. Treatment depends on location and persistence of the lesion. Complete surgical excision reported here not only removed the lesion, but also allowed normal recontouring of the tongue.

Requests for reprints should be directed to Dr. Melissa A. White, Mott Children's Health Center, 806 Tunri Place, Flint, MI 48503.

Talon cusp affecting the primary maxillary central incisors: report of case – page 283

The shape of the cusp, in this dental anomaly, resembles an eagle's talon, and cusp length may vary – sometimes extending beyond the incisal edge of the tooth. This report describes a case in which both primary maxillary central incisors were affected, in a one-year-old Hispanic male.

Requests for reprints should be directed to Dr. Charles K. Morin, Department of Pediatric Dentistry, Baylor College of Dentistry, 3302 Gaston Avenue, Dallas, TX 75246.

Complex odontoma: report of case – page 286

This is a case report of a six-year-old boy with a complex odontoma, associated with an unerupted central incisor with a hypoplastic defect in the enamel and a malocclusion. Expedient removal provided an unobstructed path for the eruption of the central incisor.

Requests for reprints should be directed to Dr. Melanie S. Thwaites, Howard University, College of Dentistry, 600 "W" Street, N.W., Washington, D.C. 20059.

Cherubism: report of three cases – page 289

Cherubism is a very rare, inherited autosomal-dominant disease, affecting mostly the mandible. Usually the chief complaint on examination is painless bilateral swelling involving the angles of the mandible. On palpation, the lesions are hard and the jaw is expanded; often there is displacement of erupted teeth.

Requests for reprints should be directed to Dr. Jagu R. Patel, Department of Dental Radiology, University of Alabama in Birmingham, University Station, Birmingham, AL 35294.

A three-year clinical comparison of a sodium monofluorophosphate dentifrice with sodium fluoride dentifrices on dental caries in children

Fluoride

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R.W. Lehnhoff, BS

The efficacy of a fluoride dentifrice against dental caries is now thought to be due in large part to the acquisition of fluoride ions by the tooth enamel, directly or through a hydrolysis mechanism. The acquired fluoride ions are thought to drive the natural demineralization- remineralization equilibrium toward remineralization. It is reasonable to expect efficacy to be enhanced by increasing the availability of fluoride ions from a specific formulation through improved compatibility of the fluoride active with certain dentifrice components, such as the detergent and polishing systems of the dentifrice. Since the advent of fluoride dentifrices some thirty years ago, it has been a goal of dental research efforts to identify more effective formulations. To cite a few of these efforts, Reed has shown that the anticaries action of a sodium fluoride dentifrice with a high beta-phase calcium pyrophosphate abrasive system has a linear relationship with sodium fluoride concentrations ranging from 0.055 percent to 0.22 percent.[1] The den-

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Table 1 ☐ Balance of subject groups.

			Sex		Starting age		Initial DMFT*		Initial DMFS**	
	Dentifrice	N	M	F	Mean	Range	Mean	SEM***	Mean	SEM***
Subjects	1100 NaF	1491	746	745	10.48	7-15	2.60	0.065	4.17	0.122
starting	2800 SMFP	1503	743	760	10.46	7-15	2.72	0.076	4.25	0.126
study	2800 NaF	1500	732	768	10.50	8-14	2.67	0.066	4.33	0.130
Subjects	1100 NaF	703	364	339	10.22	7-15	2.42	0.086	3.89	0.160
completing	2800 SMFP	673	339	334	10.18	8-14	2.57	0.100	4.08	0.184
3 Years	2800 NaF	679	345	334	10.25	8-14	2.55	0.098	4.07	0.186

*Decayed, missing or filled teeth.
**Decayed, missing or filled surfaces.
***Standard errors of the means.

tifrice formulations in Reed's study had a fluoride availability of only 70 to 75 percent because of the binding of fluoride by calcium ion. Koch's investigation, along with those of Forsman and Edlund and Koch, has suggested that the anticaries action of sodium fluoride might be improved by a more compatible dentifrice abrasive.[2-4] Two parallel caries studies by Zacherl and by Beiswanger *et al* revealed that a 0.243 percent sodium fluoride dentifrice, containing a silica abrasive, yielded more than 95 percent of the total fluoride content and had a better clinical anticaries effect than a 0.4 percent stannous fluoride dentifrice with a calcium pyrophosphate abrasive.[5,6]

Dentifrices containing sodium fluoride (NaF) and sodium monofluorophosphate (SMFP) have been shown to be effective against caries, when used in conjunction with customary oral hygiene practices and professional care.[7] The current marketed brands in the United States have fluoride levels ranging from 1000 to 1500 ppm. Some dentifrices with higher fluoride levels have been tested, however, particularly in Europe.[8-12] In recent years, manufacturers and academic institutions alike have been highly interested in seeking the optimal level of fluoride in dentifrices. There have been few published reports of direct comparisons of NaF and SMFP dentifrices against a positive control.[13,14]

The purpose of this study was to compare the anticaries effects of three fluoride-containing dentifrices:

☐ 1100 ppm F as NaF (positive control*)
☐ 2800 ppm F as SMFP
☐ 2800 ppm F as NaF

All three dentifrices contained the same compatible silica abrasive and other excipients. For that reason, the availability of fluoride and consequently the efficacy of the dentifrice were as nearly as possible due to the fluoride sources and not substantially affected by the abrasive and other excipients of the formulation.

*Advanced Formula Crest. Procter & Gamble Company, Cincinnati, OH.

MATERIALS AND METHODS

Approximately 4500 school children, whose ages ranged from seven to fifteen years, were recruited in the Portland, OR, area to participate in this double-blind clinical study. The water supply in this area contained less than 0.3 ppm fluoride. Participation was voluntary, with the understanding that the children were free to withdraw at any time for any reason. Written informed consent was obtained from the parent or guardian of each child. Children wearing orthodontic appliances, or with an unsuitable medical history as determined by the investigator, were not included in this study.

All subjects were examined by one experienced caries examiner under artificial light, using fiber optics, mouth mirrors, compressed air, and sharp dental explorers. The examiner employed the criteria described by Radike for clinically diagnosing caries lesions.[15] In addition, a bitewing radiographic series was taken on the subjects at the time of the clinical examination. The number of bitewing films varied from zero to four per subject, depending on the number of permanent teeth and the accessibility of proximal contacts of the teeth. Double film packets were used throughout the study and a duplicate set of films was sent yearly to each participant's dentist. The radiographs were interpreted by the clinical examiner and used to supplement the visual-tactile examination. All clinical examinations and radiographic interpretations were independent of previous examination records.

Following the baseline examinations, the subjects were separated by sex and intervals of age, and were stratified by DMFS intervals as diagnosed by visual-tactile examination. Within each stratum the subjects were assigned at random to three treatment groups. Care was exercised to ensure that siblings were assigned to the same treatment to avoid having different dentifrices in the same household.

Toothbrushes and assigned dentifrices, labeled with the subject's name and unique identification number, were supplied by the study's sponsor in plain white 2.7-

Table 2 ☐ Observed caries results.

			Δ DMFT*			Δ DMFS**		
	Dentifrice	N	Mean	SEM***	% Red.	Mean	SEM***	% Red.
Subjects	1100 NaF	1148	0.93	0.047	—	1.63	0.082	—
completing	2800 SMFP	1146	0.90	0.044	3.2	1.55	0.076	4.9
1 year	2800 NaF	1138	0.84	0.046	9.7	1.45	0.076	11.0
Subjects	1100 NaF	874	1.46	0.071	—	2.49	0.125	—
completing	2800 SMFP	871	1.33	0.066	8.9	2.38	0.119	4.4
2 Years	2800 NaF	849	1.26	0.070	13.7	2.20	0.122	11.6
Subjects	1100 NaF	703	2.58	0.108	—	4.40	0.195	—
completing	2800 SMFP	673	2.51	0.104	2.7	4.37	0.207	0.7
3 Years	2800 NaF	679	2.22	0.100	14.0	3.88	0.186	11.8

*Decayed, missing or filled teeth.
**Decayed, missing or filled surfaces.
***Standard errors of the means.

Table 3 ☐ Tests of significance.

		1 Year		2 Years		3 Years	
		t***	Sig.	t	Sig.	t	Sig.
1100 NaF vs. 2800 SMFP	Δ DMFT*	0.46	No	1.35	No	0.47	No
	Δ DMFS**	0.82	No	1.06	No	0.68	No
1100 NaF vs. 2800 NaF	Δ DMFT	1.37	No	2.01	Yes	2.45	Yes
	Δ DMFS	1.78	No	2.38	Yes	2.87	Yes
2800 SMFP vs. 2800 NaF	Δ DMFT	0.94	No	0.73	No	2.01	Yes
	Δ DMFS	0.90	No	1.22	No	2.11	No

*Decayed, missing or filled teeth.
**Decayed, missing or filled surfaces.
***Critical t-value for significance for one-tailed comparison = 1.645 and for two-tailed comparison = 1.96.

oz. tubes every six months. The effective ages of the three dentifrices were similar at the time of distribution to the subjects. Toothbrushes and dentifrices were issued to the children at their schools. The use of the dentifrices was ad libitum at home. The subjects were encouraged to continue regular visits to family dentists.

Following the initial assignment of subjects to treatment groups, the investigator was provided with a file of sealed envelopes, one for each subject, so that he could determine, if necessary, the treatment assigned to an individual subject during the study without breaking the double-blind nature of the study for the remainder of the subjects. This file also served the investigator in independently verifying the treatment assignments and the study results at the completion of the study.

RESULTS AND DISCUSSION

A covariance analysis was performed on the three-year decayed, missing or filled surfaces (DMFS) increments using the method described by Grainger *et al.*[16] Subsequently, pairwise covariance analyses were performed for the three dentifrice groups. The three-year decayed, missing or filled teeth (DMFT) increments were analyzed using the t test. Pairwise analyses were also applied to the interim one-year and two-year examinations. One-tailed tests of significance were used in the comparisons with the positive control and a two-tailed test of significance was applied to the comparison between the 2800 ppm SMFP and 2800 ppm NaF groups.

Table 1 shows the initial allocation of subjects to dentifrice groups in terms of sex, age, and the mean numbers of decayed, missing, or filled teeth (DMFT) and surfaces (DMFS) for those subjects starting the study and those completing three years.

Table 2 shows the caries results in DMFT and DMFS increments for subjects completing the one-year, two-year, and three-year examinations. The percent reductions for each test dentifrice are compared to the positive control. The specific pairwise tests of significance are presented in Table 3.

The results of this study show that no significant differences were found between the 2800 ppm SMFP group and the positive control, the 1100 ppm NaF dentifrice, at any point during the three years of the study.

The 2800 ppm NaF dentifrice showed significant reductions vs. the positive control and the 2800 ppm SMFP dentifrice in terms of DMFT and DMFS after the final three-year examinations.

Based on the covariance analysis of the three-year DMFS increments, the estimate of the percent reductions for the 2800 SMFP dentifrice and the 2800 NaF dentifrice are 4 percent and 15 percent, respectively.

These clinical findings are supported by laboratory data and are emphasized by Stookey, who relates the advantage of NaF to its higher uptake by incipient lesions than that of SMFP.[7]

We conclude, therefore, that a clinical advantage has been shown for NaF in a dentifrice. The clinical results from this study are in agreement with *in vitro* fluoride-uptake data and provide further confidence in the general predictive usefulness of laboratory fluoride-uptake measurements.

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This investigation was supported by a grant from the Procter & Gamble Company, Cincinnati, OH. The cooperation of Mr. B.W. Bollmer and Dr. W.E. Cooley of the Procter & Gamble Company is appreciated in the statistical analyses and presentation of the data.

Reorder number: 183-4293

THE CHEMICAL CONTENT OF U.S. WATER

Even after such purification processes as filtration, settling, aeration and chlorination, most municipal water supplies still contain some dissolved substances which may strongly affect the taste, the color and the general quality of the water. Very few dissolved substances are beneficial—with the notable exception of fluoride which, in minute traces, strengthens children's teeth.

Leopold, L.B. and Davis, K.S.: Water. Alexandria, VA: Time-Life Books, 1980, p 194.

Frequency of undesirable side-effects following professionally applied topical fluoride

Loretta K. Rubenstein, DDS
Mitchell A. Avent, DDS

Topical application of fluoride (F) to teeth has been investigated since the 1940's. Neutral sodium fluoride, stannous fluoride and acidulated phosphate fluoride (APF) have been the most widely used forms of fluoride. APF was introduced in the 1960's and its popularity continues to grow. The APF solutions and gels usually contain 1.23 percent sodium fluoride and it is recommended that they be reapplied every six to twelve months.[1]

Because of convenience and effectiveness, the use of a tray for applying APF gel has become the most popular method for operators.[1-3] The many F products and tray systems available for such use have been investigated in numerous studies. These studies showed that a substantial amount of F may be retained in the mouth and ingested during treatment, and that the actual amount of F ingested is affected by many variables.[3-7] Some considerations are the amount and form of F used, type of application tray, the quality of suction and expectoration, application time, patient cooperation, and patient age.[5]

Heifetz recommends the use of 2.5 ml APF gel per tray or a total of 5 ml gel (1.23 percent F).[12] Doyle and LeCompte reported an average amount of APF gel dispensed for a topical F treatment was 2.0 to 3.6 gm per tray (4.0 to 7.2 gm total) when various tray systems were used by a variety of operators.[8] LeCompte found that when using various application techniques and applying 4.0 gm (49.2 mg F) APF gel (1.23 percent F), that 19.3 to 26.0 mg F were retained. If expectoration was employed following treatment, only 2.9 to 7.5 mg F were retained.[5] In another study, LeCompte found, when comparing application techniques, that foam-lined trays were most effective in preventing F retention and ingestion.[6] Using foam-lined trays, suction during the treatment and expectoration after tray removal reduce net retained F to an average low of 3.1 mg.[6] Other researchers report retained F doses ranging from 11.0 to 35.0 mg.[3,4,9] The least effective forms of F application (i.e., when the least F is recovered from the oral cavity following F application) are the use of the paint-on technique using cotton rolls instead of trays and the use of custom fitted mouth trays.[4,6] With paint-on application 12.0 to 17.4 mg F was reported retained in two separate investigations by LeCompte.[10,11] Using custom fitted vinyl trays, Ekstrand and LeCompte found retention rates of 31.2 mg F (78 percent) and 25.4 mg F (52 percent).[4,10,11] Following one minute of expectoration after removal of the custom fitted trays, LeCompte recovered an additional 19.5 mg F, leaving a net retained oral F dose of only 5.9 mg.

Standard application technique is to insert the trays together or individually in the patient's mouth. The F is left in contact with the teeth for four minutes. Because the APF gel is acidulated (pH 3.5) and flavored, salivary

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flow is stimulated and swallowing of excessive saliva and gel is encouraged.[3] To reduce F ingestion, the suction tip should be in the mouth during the entire treatment period. After removal of the trays, the child should be asked to expectorate for at least one minute to reduce further F retention and ingestion. Heifetz made the following recommendations to reduce F retention during a professional APF gel tray application:

- ☐ Warn the patient not to swallow.
- ☐ Use no more than 2.5 ml gel per tray.
- ☐ Use trays with absorptive liners.
- ☐ Seat patient in upright position.
- ☐ Use suction.
- ☐ Insist that the patient expectorate, following treatment.[12]

Ingested F is absorbed from the gastrointestinal tract into the blood, and deposited into bone or excreted by the kidneys. Plasma concentrations of F peak in thirty to sixty minutes after ingestion.[12] Fourteen hours after a 5 ml (1.23 percent F) F gel application, plasma levels are still approximately ten times higher than baseline.[3]

Signs and symptoms of F toxicity begin as nausea and vomiting, resulting from gastrointestinal irritation. They appear within thirty minutes after ingestion and may last for twenty-four hours. At higher doses, the patient becomes acidotic, comatose, convulsive and may experience cardiac arrythmias. Death may follow with cardiac failure or respiratory paralysis. The certain lethal dose (CLD) is 32 to 64 mg F per kg of body weight.[12]

TREATMENT

Fluoride is an effective emetic and in large doses usually produces vomiting, soon after ingestion. If excessive F ingestion is suspected and vomiting has not occurred, emesis should be induced with Ipecac syrup or with mechanical stimulation to the back of the throat. Metallic ions in the diet (calcium, magnesium and iron) retard absorption from the gastrointestinal tract by combining with the F ion. In addition to the induction of vomiting, therefore, an antacid, which contains aluminum or magnesium hydroxide, or milk, which contains calcium, should be administered. These products bind with the F ion to reduce absorption. Following administration of initial treatment, the patient should be taken to the hospital for further observation and treatment, if necessary.[12]

The purpose of this study was to evaluate a protocol for application of topical F, and to determine the incidence of undesirable side-effects from F ingestion, following topical F treatment in a clinic setting, utilizing multiple operators.

METHODS AND MATERIALS

The Pediatric Dental Clinic at the Medical College of Virginia School of Dentistry supplied undergraduate dental students with questionnaires, to be completed partly by the students after completion of each topical F treatment, and partly by the parents. Students usually complete a topical F treatment for all new and recalled patients. They have been instructed in classroom lectures in the following protocol for the application of topical F:

- ☐ Use approximately 2 gm APF gel in each tray.
- ☐ Attempt to place both trays simultaneously.
- ☐ Place the saliva ejector in the mouth between the two trays and under the tongue.
- ☐ Allow four minutes for the treatment.
- ☐ After removing the trays have the child expectorate or suck on the saliva ejector for one to two minutes.

At the end of the appointment, the dental student completed the first part of the questionnaire (date, name, patient's reaction, any necessary changes in protocol and F flavor). The parent was then given the questionnaire to take home, complete it one hour later and return it in an accompanying self-addressed, stamped envelope. Over an eight-month period, 149 questionnaires were given to parents. The trays used for the F application were large, medium or small Centrays*, which are unlined, nonabsorptive, styrofoam trays shaped to fit the maxillary (white) or mandibular (blue) arches. The F was Nupro APF†, in orange or cherry flavor.

RESULTS

After eight months, 149 questionnaires were distributed to parents and ninety-one were completed and returned (61.1 percent). The majority of the children (62.8 percent) liked the taste of the fluoride, while 24.5 percent did not, and 12.7 percent were indifferent. There was no significant flavor preference between the cherry and orange flavors. The children surveyed ranged in age from four to fifteen years, with an average age of 9.1 years. Their weight ranged from thirty to 150 pounds with an average weight of 81.3 pounds. Twenty-seven (29.7 percent) of the children had not previously received a topical fluoride treatment.

*Centrays - Oral B Laboratories, Inc.

†Nupro APF - Johnson and Johnson, Dental Products Corp.

Four (4.4 percent) patients experienced side-effects of nausea and headaches, immediately following treatment. Of these children, two still felt ill after one hour. Two parents reported no immediate side-effects, but one reported nausea and the other vomiting, at the end of one hour. Only one child had previously experienced undesirable side-effects from a fluoride treatment and this child again reported immediate nausea. Overall, six children (6.6 percent) reported side-effects either immediately or within one hour following treatment. Of these six children only two had not previously received a F treatment. The children who experienced side-effects were aged six to twelve years old and weighed from sixty to over 100 pounds.

DISCUSSION

It was of interest to note that the majority of the children liked the taste of the F, but they did not have a preference for either orange or cherry. The trays used were not foam-lined as recommended by LeCompte.[5] Though the incidence of nausea was low (6.6 percent), it is probable that using trays with an absorptive liner would have resulted in even fewer undesirable side-effects. It is presumed that the low incidence of nausea and associated unpleasant effects can be attributed to the technique, which used suction during and immediately following the treatment and limited the amount of F per tray to 2 gm.

The percentage of questionnaires returned was 61.1. Of those not completed and returned, parents probably noted no side-effects, since most people are more likely to complete a questionnaire, when there is a problem to report. The assumption is made that if all questionnaires were returned, the incidence of nausea would be lower than the 6.6 percent reported by the 61.1 percent returning the questionnaires.

A surprising observation was that age and weight were not contributory to reported side-effects. The expected relationship between the younger child with less body weight and less controlled swallow reflex and incidence of nausea was not seen. This may be attributed to the fact that the dental students are warned to be extremely careful with the young child during a F treatment, and to remind the child repeatedly to use the suction rather than swallow.

There are several possible explanations for the undesirable side-effects reported. The use of trays without absorptive liners probably increased the amount of retained and ingested F. The children reporting nausea may have been excessively sensitive to the controlled amount of F they received or they may have swallowed instead of using the suction as instructed. Another possibility would be the students' failure to follow carefully the established protocol for F treatment.

The authors recommend use of this protocol with the possible substitution of trays with absorptive liners. Careful adherence to the established protocol and frequent reminders to the patient to use the suction should result in a minimum of undesirable side-effects, following topical F treatment.

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Epidemiology

Increasing use of dental services by very young children

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The general population is well aware of the need for regular dental checkups and the necessary measures to prevent dental disease. In response to a 1985 national study on health promotion and disease prevention,

- ☐ More than 95 percent of the respondents over seventeen years of age reported it was important to see a dentist on a regular basis.
- ☐ Ninety-eight percent recognized the importance of brushing and flossing of teeth.
- ☐ Ninety-six percent recognized the primary causes of the loss of teeth in children.[1]

But is this knowledge translated into appropriate associated actions? For example, are children, (in particular young children) receiving dental treatment and have there been any changes?

The recent publication of data from the National Health Interview Survey on the use of preventive care procedures by the general public, answers this question with the strong positive pronouncement that, "between 1973 and 1982, there was a marked increase in dental care occurring before five years of age among both white and black children."[2] There were considerable differences in the visit pattern, however, by different population groups.

In general

In 1982, one-half of all children, in the five to eight- year age-group, first visited the dentist before they were five

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years of age. By contrast, only a third (34.5 percent) who reached the age of five during 1971-1972 (i.e. those fifteen to sixteen years of age in 1982) had visited a dentist before the age of five. During this ten-year period, there was essentially no difference between young girls and boys in the rate of early dental visits (Table 1).

Table 1 ☐ Percentage of children five to sixteen years of age who had a first dental visit before five years of age, by selected demographic characteristics: 1982[2]

Characteristic	Age at time of interview			
	5-8 years	9-11 years	12-14 years	15-16 years
Total	50.6%	44.5%	39.2%	34.5%
Gender				
Male	51.2	45.0	39.1	34.1
Female	50.0	44.1	39.3	34.8
Race				
White	53.0	48.0	42.9	38.3
Black	39.0	28.8	21.7	15.7
Other	44.1	33.1	23.5	17.8*
Hispanic Origin				
Non-Hispanic	52.8	46.1	41.1	36.5
Hispanic	32.0	29.3	17.5	14.3
Income				
Less than $10,000	38.2	31.9	23.2	17.8
$10,000—$19,999	44.7	40.0	31.6	27.8
$20,000—$34,000	55.2	46.3	42.6	37.9
$35,000 +	70.5	61.5	56.2	52.4
Geographic region				
Northeast	54.8	48.1	42.8	38.2
N. Central	55.4	50.0	45.8	40.9
South	44.4	38.2	33.2	25.9
West	50.1	44.1	37.2	37.0
Place of residence				
SMSA**	51.8	45.8	40.0	37.1
Central city	46.1	37.5	30.7	27.9
Not central city	55.6	51.1	45.3	42.3
Outside SMSA	48.2	42.1	37.8	28.8

*Relative standard error in excess of 30 percent. The relative standard error of an estimate is obtained by dividing the standard error (i.e. primarily a measure of sampling variation) by the estimate itself and is expressed as a percent of the estimate.[1]
**Standard Metropolitan Statistical Area

By race

Increasing percentages of very young children in all racial groups had contact with dentists. The percentage of black children who had visited a dentist before the age of five has remained less, however, than that of children of "other" racial groups and far less than that of white children. For example, by 1982, the percentage (39 percent) of black children age five to eight who had visited a dentist before age five had increased only to the 1971-1972 percentage level (38.3 percent) of white children who had visited a dentist before age five. While the proportions of black and white children with early dental visits increased, the differences between the racial groups did not narrow (Table 1).

By hispanic origin

Between 1972 and 1982, there was an increasing percentage of Hispanic and non-Hispanic young children who visited a dentist before age five. There were major differences, however, between the two population groups. In 1982, the percentage of Hispanic young children who visited a dentist before age five was less than the percentage of young white children who, in 1971-1972, visited a dentist before age five (Table 1).

By income

At all family income levels, there was an increase in the percentage of children who visited a dentist before age five. And further, there was a direct relationship between increasing family income and the percentage of young children with dental visits. For example, the percentage of young children in families with incomes of $35,000 and over with early visits to dentists, generally was double the rate for young children in families with income below $10,000 (Table 1).

By residence location

Very young children in all geographic areas of the country increasingly are visiting dentists. Despite this general overall improvement, however, by 1982, a far smaller percentage of young child residents of the Southern region, as compared to the other geographic regions of the nation, have had early contact with dentists (44 percent vs 50 percent to 55 percent).

In addition, a smaller percentage of very young children who reside in central cities and outside of standard metropolitan statistical areas (SMSA's), as compared to young child residents of noncentral city areas of SMSA's, have had dental care before age five (Table 1).

By education

While there have been continuing overall smaller percentages of very young black children than white children with early dental visits, a review in terms of the level of education of the head of household, presents somewhat different findings.

- ☐ In families at all education levels, very young black and white children increasingly have had early dental visits.

Table 2 ☐ Percent of children five to sixteen years of age who had a first dental visit before five years of age, by race and education of head of household: 1982[2]

Race and education	Age at time of interview				Total (age adjusted)
	5-8 Years	9-11 Years	12-14 Years	15-16 Years	
White					
Total	53.0%	48.0%	42.9%	38.3%	46.4%
Less than 12 yrs	31.6	26.6	24.7	19.5	25.9
12 years	50.5	48.7	43.9	40.5	46.5
13 + years	67.3	60.8	54.8	53.0	60.2
Black					
Total	39.0	28.8	21.7	15.7	27.9
Less than 12 yrs	33.2	22.6	15.3	12.8	21.6
12 years	40.1	32.4	17.0	15.5	29.2
13 + years	48.3	35.4	43.9	22.3	39.4

- ☐ In 1982, however, in contrast with all past years and education categories, a greater percentage of black children age five to eight years than their white counterparts (from families where the head of the household had less than twelve years of education) had early dental visits (Table 2).

Overview

The increasing use of preventive dental services by very young children is part of a generally changing awareness of the value and use of health services. For example, in 1982, 96.4 percent of children under seventeen years of age had had at least one routine physical examination, compared to 86.2 percent in 1973.[2]

While many traditional use patterns for different racial groups persist, some changes are occurring for children and adult groups.

- ☐ A higher proportion of black children (71 percent) than white children (64 percent) had had a routine physical examination within the past year.
- ☐ In 1973, white females were more likely ever to have had a pap smear than were females of other races. In 1982, black females were more likely ever to have had a pap smear than white females.
- ☐ In 1982, a higher proportion of black persons than white persons had had a blood pressure test within the past year.[2]

The increasing use of dental services by very young children is part of the generally improving outlook for pediatric dentists:

- ☐ A projected numerical increase between the years 1985 and 2000 in the population below eighteen years of age.[3]
- ☐ Between 1980 and 1983, an increasing use of dental services by male and female children under seventeen years (total number of visits and visits per person).[4,5]
- ☐ A general leveling down in the "production" of dental practitioners and specifically, trained pediatric dentists.[6]

Finally, it is essential to maintain an awareness that while there has been a general increase by very young children in the use of dental services, major differences persist between various demographic groups. Children from many lower income and minority families continue to receive far fewer dental services than their higher income and white counterparts.

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The relationship between the intake frequency and the total consumption of sucrose among four South African ethnic groups

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In experimental studies on adults, frequency of intake of sucrose and its total consumption have been implicated as prime causative factors in the pathogenesis of dental caries.[1] Numerous studies have been conducted on each of these factors, in isolation, but their relationship to each other is not known.

Total sugar consumption is usually determined from dietary histories. The methods employed are difficult and laborious, and, aside from elaborate epidemiological studies, are infrequently used in the dental office. Frequency data, on the other hand, are easier to obtain. Indeed, numerous means have been devised to measure this variable. With the possible exception, however, that the patient may recognize that he or she eats sweets too often, the data obtained are of limited value.[2] Missing from such an analysis is the ability to determine what sucrose intake levels are "safe" or, conversely, what levels unequivocally promote dental caries. Such levels have been suggested in a few studies that have dealt with the total consumption of sugar.[3,4] It is not possible, however, to convert the more readily obtained frequency data to these values, since the precise relationship between these variables is not known.

The objective of this study was to determine the relationship between the frequency of intake of sucrose and its total consumption; and hence to determine from these data, the intake frequency which might be considered "safe" for the dentition.

MATERIALS AND METHODS

Preprimary schoolchildren, ages two to five years, from four ethnic groups were studied: namely, rural blacks (N = 576), urban blacks (N = 1,529), urban Indians (N = 857) and urban whites (N = 1,509).

Data on sucrose consumption were collected between 1976 and 1982. The techniques employed were described in the report by Richardson *et al.*[5] The data were analyzed with an IBM 370/158 computer using SAS.[6] The frequency of sucrose intake per day was plotted against the total sucrose consumption per day and the linear regression equations and Pearson correlation coefficients were calculated for each group. An analysis of

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covariance, with sucrose frequency as the dependent variable, ethnic group and age as factors, and total sucrose intake as the covariate, was also performed. The critical level for statistical significance chosen was $p < 0.05$. Numbers in each sample group varied according to the analysis performed, because certain individuals lacked data on either frequency or total-sucrose intake.

RESULTS

The mean values for the frequency of consumption and the total daily intake of sucrose for each age and ethnic group are shown in Tables 1 and 2. The rural and urban blacks consumed between 41 g and 57 g of sugar per day; the sugar was eaten four to five times per day. The values for the urban Indians and whites were greater. The mean total daily intake of sugar for these groups varied between 71 g and 96 g; the frequency/day, between seven and nine times. With but one exception, the two to five-year-old urban Indian children, no differences could be found between frequency of the total daily sugar intake and age.

The range of values for total sucrose consumption and frequency varies widely (Tables 1 and 2). For sugar intake the range was between 0 and 303 g/day; for frequency of consumption, between zero and twenty-four.

When the data were subjected to an analysis of covariance, it could be shown that there was a highly significant positive linear relationship between the frequency of the intake of sucrose and its total consumption. Since the ethnic group and the total sucrose x ethnic group interaction were also statistically significant, however, both the intercept and slope of this line varied between the ethnic groups (Table 3). No significant association was noted with age, thus making it possible to pool the data for the four ethnic groups.

Table 4 gives the slopes, intercepts and correlation coefficients of the linear regressions of the frequency of sucrose intake against its total consumption, among the four ethnic groups. From the square of the correlation coefficients it is clear that, within any ethnic group, between 50 percent and 70 percent of the variation in sucrose frequency is predictable from the total sucrose intake. These regressions are graphically presented in Figure 1. From these it is clear that the regression lines for the rural and urban blacks were most similar, and

Table 1 ☐ Total daily sucrose intake, all ethnic groups and ages (g/day).

Group		Age			
		2 Years	3 Years	4 Years	5 Years
Rural Black	N	202	140	138	85
	Min.	0	0	0	0
	Max.	124	144	124	124
	Mean	44.2	41.3	42.0	42.7
	S.D.	26.2	24.2	25.6	25.5
Urban Black	N	231	439	377	178
	Min.	6	4	7	7
	Max.	188	186	264	140
	Mean	57.2	57.0	56.9	53.2
	S.D.	27.4	28.0	31.4	26.4
Urban Indian	N	80	64	119	584
	Min.	14	7	15	15
	Max.	200	280	205	303
	Mean	71.0	85.6	87.3	96.0
	S.D.	36.4	52.3	42.4	49.4
Urban White	N	224	309	386	378
	Min.	6	16	0	0
	Max.	302	302	254	268
	Mean	87.6	90.3	88.4	89.8
	S.D.	44.9	41.1	39.5	45.0

Table 2 ☐ Daily frequency of intake, all ethnic groups and ages.

Group		Age			
		2 Years	3 Years	4 Years	5 Years
Rural Black	N	207	145	138	86
	Min.	0	0	0	0
	Max.	12.7	12.1	12.1	11.3
	Mean	4.8	4.4	4.3	4.5
	S.D.	2.6	2.5	2.4	2.3
Urban Black	N	264	527	489	249
	Min.	0	0	0	0
	Max.	17.6	21.4	22.4	14.1
	Mean	5.5	5.0	4.5	4.1
	S.D.	3.3	3.3	3.4	3.3
Urban Indian	N	81	65	119	592
	Min.	0	0	1.1	0
	Max.	18.1	24.0	19.0	24.4
	Mean	7.1	8.5	8.1	8.7
	S.D.	3.1	4.2	3.4	3.9
Urban White	N	249	371	452	437
	Min.	0	0	0	0
	Max.	19.0	19.1	18.3	20.1
	Mean	7.7	7.2	7.3	7.3
	S.D.	4.1	4.2	4.0	4.2

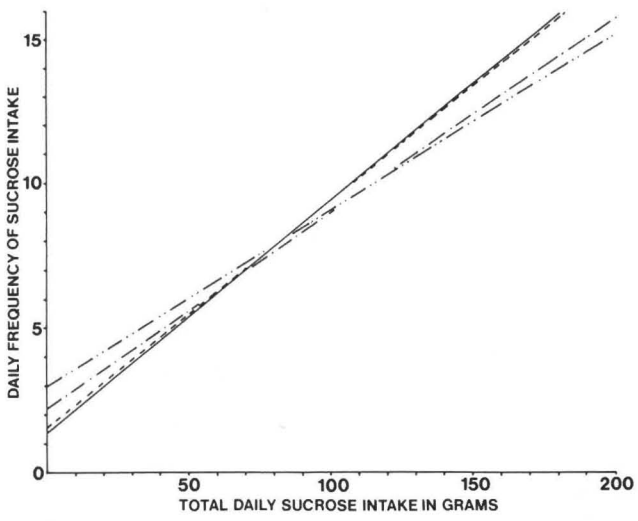

Figure 1. Regression lines for daily frequency of sucrose intake against total daily sucrose intake in grams. Rural black ———, urban black – – –, urban Indian — .. —, urban white — . —.

Table 3 □ Analysis of covariance summary.

Source	Degrees of freedom	Mean Square	F-value	P-value
Ethnic group	3	150.54	49.41	<0.001
Age group	3	3.06	1.01	0.390
Ethnic group × age group	9	3.56	1.17	0.310
Total sucrose	1	16532	5426	<0.001
Total sucrose × ethnic group	3	96.65	31.72	<0.001
Total sucrose × age group	3	4.84	1.59	0.189
Residual	3911	3.05		

were significantly different from those of the Indians and whites. The observed regressions for the blacks had the lowest intercepts and the highest slopes, whereas the converse was true for the remaining groups. These observations are highlighted in Figure 2, in which the slope and the intercept of the regression lines are plotted against each other for each of the four ethnic groups studied.

DISCUSSION

As expected, a significant, positive correlation was observed between the frequency of the intake of sucrose and its total consumption. Somewhat surprising, was the finding that the relationship between these variables was not related to the age of the subjects. These findings differ from those found in a 1967-68 survey of British preschool children.[7] In this study, conducted on one-half to four-and-one-half-year-old children, a positive association was noted between sugar consumption and age. The method used to assess sugar consumption in this study differed markedly from ours. In the British study, the mothers of the children were instructed to keep weighed records of all the food and drink consumed over a period of one week. In the present study, sucrose intake and frequency estimates were determined by trained interviewers who employed a specially designed dietary recall questionnaire.[5] Of particular interest, was the observation that significant differences are present between the linear regressions of several of the ethnic groups. The reason for these differences is unclear. It is possible that they reflect real, though currently unknown, eating patterns among these different groups. On the other hand, these computations, though statistically significant, may not be clinically important. The determination of what is or is not clinically relevant is a matter of subjective judgement. In studies such as this, where large numbers of subjects are involved, it is readily possible to demonstrate small, but statistically significant findings. But these small differences may not be clinically valid. This is particularly true in the case of nutritional investigations, where the techniques employed to assess the intake of foods is subject to great variation.

The linear regressions enable us to quantify the relationship between the frequency of the intake of sucrose and its total consumption. It has been suggested that a daily consumption of between 30 g and 50 g of sugar is, in twelve-year-old subjects, the cut-off point between the absence of caries or the prevalence of low caries rates on the one hand and high caries values on the other.[3,4] As can be seen in Figure 1, in the present study the 50 g-level corresponds to a frequency intake of five to six

Figure 2. Plot of slopes and intercepts of regression lines. Rural black ●, urban black ■, urban Indian ▲, urban white ○.

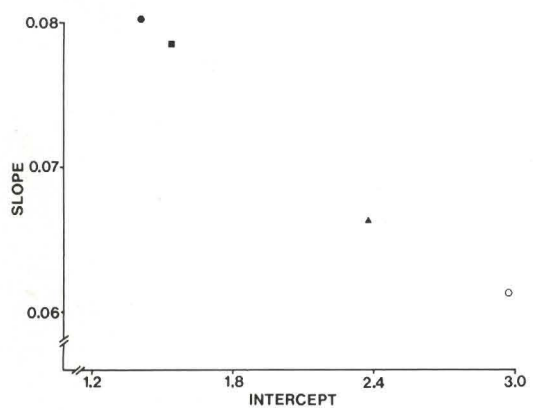

Table 4 □ Regression lines of sucrose frequency against total sucrose intake for the four ethnic groups.

Ethnic group	Intercept	Slope	Correlation coefficient
Rural Black	1.39	0.0803	0.78
Urban Black	1.53	0.0787	0.84
Urban Indian	2.36	0.0665	0.84
Urban White	2.96	0.0615	0.80

sucrose-containing foods per day; at the 30 g-level, it is equivalent to four to five sucrose exposures per day. In the previously cited study on British preschool children, it was shown that the consumption of between 54 g and 66 g of sugar per day was associated with low def rates (1.7 or less).[7] It is reasonable to propose, therefore, that five exposures to easily fermentable carbohydrates per day is "safe" for the teeth. This recommendation is in agreement with that of Granath and McHugh.[8] An example of a simple dietary questionnaire which can be used to assess the frequency of consumption of sugar foods is shown in Figure 3.

At best, epidemiological findings must be interpreted with caution. This is particularly true if one attempts to relate the findings obtained in population studies to the individual patient. The data in this study show that the range of the frequency of intake of sucrose per day varied between zero and twenty-four. Clearly, therefore, the suggestion that five sugar exposures per day are safe for the teeth is, at best, a first approximation. For individuals who are caries-resistant or, at the other extreme, for the 10 to 15 percent of the population that is particularly susceptible to dental caries, this number will have to be adjusted, respectively, upwards or downwards.

As with all studies, the data presented in this one will have to be confirmed by others. In the absence of information to the contrary, however, it would seem that the figure of five sugar exposures per day is a prudent one for the practitioner to recommend to his young patients.

SUGAR AND SWEETS

FREQUENCY OF CONSUMPTION DATA SHEET

Instructions: Put a check mark in the appropriate box for each sugar-containing food eaten per day. For examples of the types of foods to be placed in the categories listed as SOLID and LIQUID, see below.

Form of Sugar	Day 1	2	3	4	5	SUB-TOTALS
SOLID*						
LIQUID+						
TOTALS:						
FREQUENCY OF INTAKE, MEAN (TOTALS/5) =						

EXAMPLES OF FOOD TYPES

* SOLID SUGAR-CONTAINING FOODS:

Cakes; sugar-coated cereals; candy; cookies; cough drops; doughnuts; dried fruits e.g. raisins, figs, dates, prunes and apricots; fruits canned in syrup; frosting; sweetened gelatin; sugar-containing gum; honey; ice cream; jam; jelly; marshmallows; molasses; pies; pastries; puddings; sweet rolls; vegetables glazed or cooked with sugar, honey or molasses.

+ LIQUID SUGAR CONTAINING FOODS:

Sugar-containing beverages ("soft drinks"); sugar added to coffee or tea; sugar added to cereals; sugar-containing medicines e.g. cough syrups; sweetened, condensed milk; sweetened sauces.

Figure 3. Example of a simple frequency of sucrose intake questionnaire.

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THE UNIVERSAL SOLVENT

Water is close to being the all-purpose chemical solvent; it will dissolve almost any inorganic substance. In fact, about half of the known elements are found in the earth's waters.

Without water's property of solubility, nutrition could not go on: All living organisms depend on water to dissolve the substances they feed on. The roots of plants cannot absorb food in the soil unless it is in solution, and humans' food must be dissolved before it can enter the bloodstream.

Leopold, L.B., and Davis, K.S.: Water. Alexandria, VA: Time-Life Books, 1980, p24.

The effects of spastic cerebral palsy on occlusion

Clinic

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Recently much attention has been focused on health care, education and employment of handicapped persons. Dental treatment is one of their greatest needs. Miller stated that one of the reasons for this need is the lack of factual information for the dentist regarding the handicapped patient.[1]

There are contrasting reports in the literature regarding the incidence of malocclusion in cerebral palsy children. The reports range from neutroclusion to distoclusion.

The incidence of cerebral palsy at birth varies. Eiben found an incidence of approximately 7 per 1,000 live births and a prevalence of nearly 500 cases: 100,000 population.[2] Pearlstein states there are about 800,000 cerebral palsy patients in the United States.[3]

The multiplicity of handicaps in the child with cerebral palsy requires a comprehensive assessment. The deficit most commonly associated with cerebral palsy is mental retardation, occurring in 50-70 percent of the patients.[4] Limitations of sensory motor deficits present a disadvantage in classical testing.

The purpose of this research was to compare the dental casts and lateral cephalometric radiographs of thirty children with spastic cerebral palsy with a control group consisting of thirty normal children. They were matched according to age, sex, and racial or ethnic backgrounds. The objective was to determine what effect spasticity and cerebral palsy have on dental occlusion and skeletal formation.

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REVIEW OF LITERATURE

Dr. William John Little, an English orthopedic surgeon, is credited with the first clinical description of spastic cerebral palsy.[5] Little emphasized birth trauma as an etiologic factor in this condition, and palsies of cerebral origin were subsequently referred to as Little's Disease.

Bronson Crothers pioneered the use of a multidisciplinary approach to both evolution and treatment of cerebral palsy children.[6] There followed an expanded use of multidisciplinary programs and facilities. Dr. Eric Denhoff also emphasized the multidisciplinary approach and characterized cerebral palsy as the "syndrome of cerebral dysfunction."[7]

Cerebral palsy was defined by a group of experts as a nonprogressive disorder of motion and posture due to brain insult or injury occurring in the period of early brain growth.[8]

Dentists should recognize that some patients have impairments that are functional rather than mental. Barber stated that the child's ability to learn is a factor in successful treatment.[9] If the child is severely retarded, successful dental care will depend on the adult responsible.

Occlusion and related factors

The incidence of malocclusion and related factors in cerebral palsy has been studied with contrasting results. Rosenbaum found no difference in the frequency of malocclusion and factors affecting occlusion of 124 cerebral palsy children between the ages of six to twelve years.[10] Miller found frequent trauma to the incisor teeth, which are predisposed to anterior protrusion.[1] He found the children to have smaller palates and larger tongues than normal children. This is in contrast to Dummett who found no variation in the palatal arches.[11] Dummett did find, however, that spastic cerebral palsy children showed a significantly longer maxillary dental arch anteroposteriorly.

Jackson postulated that disturbances of the facial, masticatory, and tongue musculature are the cause of the increasing incidence of orthodontic problems and he supports this with a study that shows cerebral palsy children with primary dentitions having more normal or minor malocclusions than the older cerebral palsy patients whose deranged neuromuscular complex has had a longer period of time to bring about maldevelopment.[12]

METHODS AND MATERIALS

The subjects for this investigation were thirty spastic cerebral palsy children. The age-range was four years, five months to twenty-two years, seven months.

The control group consisted of thirty normal children. They were matched as closely as possible to the experimental group in regard to age (or - 6 months), sex, and ethnic or racial backgrounds. Within each group there were sixteen males and fourteen females ranging in age from four years, five months to twenty-two years, seven months. The average age was 11.27 years for the spastic cerebral palsy child, and 11.33 years for the normal child. There were eight Black children, eight Hispanic children, and fourteen Caucasian children.

Alginate impressions were taken of the maxillary and mandibular dentitions. A wax bite was taken in centric occlusion. The impressions were poured in orthodontic stone and trimmed. The following measurements or evaluations were made:

Occlusion

Classification was recorded according to Angle.[13]

Dental arch-breadth

The distance was measured in millimeters using a Boley gauge between the corresponding teeth on the left and right sides of the arch. The distance between the crown tips of the canines and the distance between the mesiolingual cusps of the first permanent molars were measured.[14]

Dental arch-length

The distance measured in millimeters between a line tangent to the labial surfaces of the central incisors and a line connecting the most dorsal points on the distal surfaces of the second premolars.[14]

Dental arch-circumference

The length of the curved line is measured passing over buccal cusps or incisal edges of the teeth from the mesial surface of the left permanent molar to its antimere.[14]

Measuring technique

Two stainless steel tubes, 0.9 mm with flanges, and a 0.14 mm wire were used. The wire was soldered to one

Table 1 ☐ Results of the dental casts.

Variables	Spastic cerebral palsy group	Normal group	t Value	Paired comparison significance
Arch breadth				
Maxillary canines	32.6 mm.	32.3 mm. *(28)	0.31	N.S.
Maxillary molars	39.2	39.2 *(23)	0.40	N.S.
Mandibular canines	26.3	25.9 *(27)	0.74	N.S.
Mandibular molars	33.2	34.1 *(24)	0.81	N.S.
Arch length				
Maxillary	29.2	26.9	2.75	Sig. P 0.01
Mandibular	24.4	23.5	1.71	Sig. P 0.1
Circumference				
Maxillary	82.2	78.9	1.97	Sig. P 0.1
Mandibular	72.4	69.4	2.14	Sig. P 0.05
Overbite	2.5	2.4	0.24	N.S.
Overjet	4.5	3.0	2.47	Sig. P 0.05

*(Number of each subject was 30 unless otherwise indicated.)

tube. The tube was positioned on the dental casts, its flange touching the mesial surface of the first permanent left molar. The wire was bent along the buccal cusps of the incisal edges of the teeth and kept in place with pellets of wax. The flange of the second tube was contacted with the mesial surface of the right first permanent molar. The wire was immobilized with a drip of hot, sticky wax. It was carefully removed from the dental cast, and the wire was allowed to form a straight line. The distance between the two flanges was measured with a sliding calipers.

Overbite and overjet

The degree of vertical overbite in millimeters was recorded as that part of the crown height of the mandibular incisors which was overlapped by the maxillary incisors. The degree of horizontal overjet was recorded in millimeters as that distance between the maxillary and mandibular incisors in a sagittal plane.[14]

Open bite

Open bite is measured with a sliding calipers in millimeters as the distance between the incisal edges of the maxillary and mandibular incisors in the vertical frontal plane.[14]

Lateral cephalometric radiographs

The patient was oriented so that the midsagittal plane of the subject's head was placed 60 inches from the target of the X-ray tube with the left side of the subject toward the film. The Frankfort plane was parallel to the floor, and the teeth were in centric occlusion.

All of the tracings and measurements were scored randomly. The statistical analysis consisted of means, paired comparison t tests, and coefficient of correlations. They are from established statistical analysis as shown by Chilton.[15]

RESULTS

Occlusion

The spastic cerebral palsy group demonstrated a statistically significant Class II occlusion (20) compared to the normal group (12). There were fifteen Class II division 1 children in the study group and five Class II division 1 in the normal group. There were five Class II division 2 in the study group compared to seven in the normal group. This study showed ten Class I occlusions in the spastic cerebral palsy group compared to eighteen in the normal group. No Class III occlusions were noted.

Dental arch-breadth

There were no significant comparisons with each group in the measurements of the maxillary and mandibular arch-breadths in the intercanine and intermolar widths (Table 1).

Dental arch-length

There was a significant difference with the spastic cerebral palsy group compared to the normal group in the maxillary dental arch-length at the $P < 0.01$ level and in the mandibular dental arch-length at the $P < 0.1$ level. It was longer in both measurements (Table 1).

Dental arch-circumference

Significance was attained in the circumference of the maxillary arch at the $P < 0.1$ level and in the mandibular arch at the $P < 0.05$ level. The spastic cerebral palsy group had larger circumferences in both instances (Table 1).

Overbite and overjet

The overbite was not significant, although it was slightly larger in the study groups. The overjet was significantly larger in the spastic cerebral palsy patients at the $P < 0.05$ level (Table 1).

Open bite

The number of open bites in the spastic cerebral palsy group was fifteen. The number in the normal group was eight. This was not statistically significant.

Lateral cephalometric radiographs Angular measurements

There were two statistically significant angular measurements, ANB°, and FH-NP°. They were larger in the spastic cerebral palsy group than in the normal group. The SNA°, SNB°, SN-GoGn° were slightly larger in the spastic cerebral palsy group (Table 2) (Figure).

Linear measurements

There was not statistical significance regarding proportional measurements in the Di Paolo analysis.[16] However, the maxillary bony arch-length, anterior dental height, and posterior dental height were all proportionately larger in the study group. The mandibular bony arch-length was 0.2 mm smaller in the spastic cerebral palsy children.

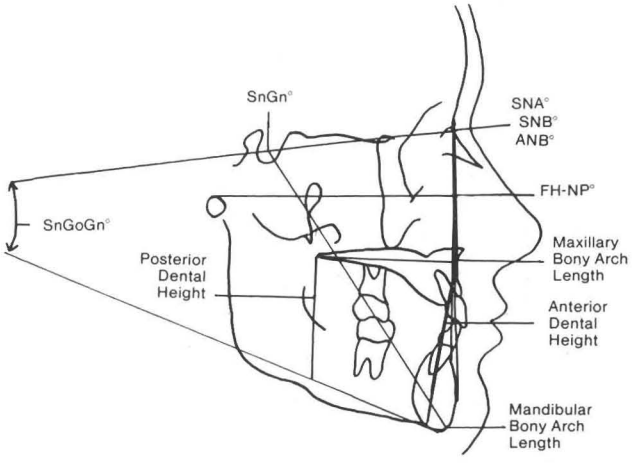
Intratester and intertester reliability

Six tracings and measurements were taken on a randomly selected sample to determine intratester reliability. In no measurement were there any major differences in the means, and none of the differences were close to significance.

Table 2 □ Results of the lateral cephalometric radiographs paired comparison t tests.

Variables	Spastic cerebral palsy group	Normal group	t Value	Paired comparison significance
SNA°	83.4 ave.	81.4 ave.	1.44	N.S.
SNB°	76.8	76.4	0.31	N.S.
ANB°	6.5	5.0	2.06	Sig. P 0.05
Sn-GoGn°	38.7	37.0	1.10	N.S.
SnGn°	69.9	68.8	0.84	N.S.
FH-NP°	88.1	84.4	2.83	Sig. P 0.05
MxBAL mm.	50.8	50.6	0.12	N.S.
MBAL mm.	49.8	50.0	0.17	N.S.
ADH mm.	65.6	63.9	0.96	N.S.
PDH mm.	41.8	40.9	0.74	N.S.
Average mm.	53.7	52.4	0.77	N.S.

Figure. Diagram of angular and linear variables measured on each lateral cephalometric radiograph.



DISCUSSION

Moss' functional matrix theory explains that any given bone grows in response to functional relationships established by the sum of all the soft tissues operating in association with that bone. This means that the bone does not regulate the rate and direction of its own growth; the functional soft tissue matrix is the actual governing determinant of the skeletal growth process. The course and extent of bone growth are secondarily dependent upon the growth of pace-making soft tissues. Bone and cartilage present are involved in the functional matrix theory as they feed back information to the soft tissues. This causes the soft tissues to inhibit or accelerate the rate and amount of subsequent bone growth activity depending on the status of functional and mechanical equilibrium between the bone and soft tissue matrix.

The neurotrophic factor involves the network of nerves as links for feedback interrelationships among all the soft tissues and bones. The nerves provide pathways for stimuli that trigger bone and soft tissue responses. It appears to function by transport of neurosecretory material along nerve tracts or by an axoplasmic streaming within the neuron. In this way feedback information is passed from the connective tissue stroma of a muscle to the periosteum of the bone associated with the muscle.

The basic hypothesis of this study is that muscle spasticity has a direct relationship to dental and skeletal formation. The spasticity induces neuromuscular in-

volvement and consequently bone involvement.

Spasticity is characterized by the pathologic stretch reflex, which is the exaggerated contraction of muscles subjected to stretch. The degree of vigorousness depends upon the degree of spasticity. It also involves clonus, which is a spasm in which rigidity and relaxation alternate in rapid succession. Head and neck musculature, bone, nerves, blood vessels, connective tissues and epithelia represent an interdependent development composite. When the motor nerves that supply the muscles of mastication are in spasm, they can remodel the bones of the face.

The spastic cerebral palsy children had an increase in the maxillary and mandibular arch-length anteroposteriorly. Dummett also found a maxillary anteroposterior increase in spastic cerebral palsy children.[11] This can also be related to forces developed through the functional disharmonies of anterior tongue thrust and mouth breathing. A spastic cerebral palsy child with head and neck involvement has postural defects that follow when the muscles of the chest, the back and the neck do not function in proper synergistic manner. The drooping of the mandible may be due to other causes, such as a lack of muscular tonicity when the muscles are not in spasm. Between tongue thrusting and mouth breathing, therefore, there is a mesial anterior force component that would enhance an increase in anteroposterior arch-length development.

The maxillary and mandibular arch-length circumferences were significantly larger in the spastic cerebral palsy group than in the normal group. This could be caused by an increase in tongue function as previously noted, and by the authors direct contact with the patients. Miller found cerebral palsy children to have broader tongues mesiodistally than normal children.[1] Perhaps he did not measure total tongue volume and his observation that the tongue was somewhat larger in a lateral width was due to muscle disharmony which is found in cerebral palsy patients.

There was a statistically significant increase in overjet in the study group. This can be attributed partly to the maxillary orbicularis oris muscle which may fail to keep the maxillary lip closed. The mandibular orbicularis oris muscle works synergistically with the mentalis muscle. When the muscles of mastication are hypertonic, the mandible is held back. When a spastic patient grimaces, the maxilla is held back. The alveolar process is not held back which also contributes to overjet. Voluntary muscle can be influenced by habituation and function. The muscles of facial expression and the mimetic and vocal muscles are the youngest from an evolutionary standpoint and are most easily influenced. This is especially true of the orbicularis oris and mentalis muscles, according to Salzman.[18]

There were fifteen open bites in the present study group and eight in the normal group. Open bite is caused by aberrant tongue posture, head posture, and abnormal swallowing. There can be a lack of balance pull on the angle of the mandible as compared to pogonion. This could be due to abnormal contraction and abnormal firing of the suprahyoid muscles during spastic seizures. Thus the muscles attached on the anterior of the mandible would be firing more frequently than in the posterior of the mandible. Rosenbaum also found a greater degree of open bite and slightly greater incisal overjet.[10]

Interpretation of the cephalometric measurements

The significant ANB angle shows a difference in the bony apical base measurement of the spastic cerebral palsy group. They have a greater Class II skeletal tendency. According to Steiner a large ANB angle value exhibits incisor procumbency.[19] The patients in this study exhibited this. The relationship of the maxillary apical base and the mandibular apical base of the cranial base (SNA° and SNB°), were slightly larger in the spastic cerebral palsy group as compared to the normal group.[20] This is further expression which seemed to have occurred because of aberrant muscle function. The SNA° at 83.4° in the study group demonstrates a protrusive maxillary apical base. The SNB° at 76.8° in the study group demonstrated a retrusive mandible at point B.

The facial angle (FH-NP°) showed the study group to have a significantly greater protrusion of the chin point (Pog). It was 88.1° in the spastic cerebral palsy children and 84.4° in the normal group.

The Y growth axis (SnGn°) is a measurement used by Downs to determine the direction of growth of the chin point and thus serve as a guide indicator of the growth pattern.[21] The experimental group indicated a growth pattern statistically within normal bounds, which was 69.9°. It was 68.8° in the normal group. This resulted in a downward and forward growth pattern of the mandible.

The linear proportions in the Di Paolo analysis, Mx-BAL, ADH, PDH, and AVE were within normal limits in the spastic children.[16] When the mandibular bony arch length was compared to the normal group, it was slightly smaller. This can be due to a lack of proper development in the region of the lower one third of the face. The effect hinders normal skeletal development due to hypertonicity of the suprahyoid, depressor labii inferioris, and platysma muscles.

Throughout this study it was seen that spastic cerebral palsy children show a marked Class II division 1 dental and skeletal tendency. There is reason to suppose that the motor disorder in individual cases may accentuate tendencies toward a malocclusion. Muscle spasticity can retard bone growth. Future electromyographic studies may substantiate this concept in further depth. The variation in the normal tonus of the muscles of the head and neck are important from an etiological standpoint as causes of a malocclusion and arch deformity.

CONCLUSIONS

Spastic cerebral palsy children have a greater tendency toward a Class II dental and skeletal formation.

Motor disorders in individual children accentuate tendencies toward a malocclusion.

The ectodermal trilogy of teeth, brain and eye deformities may be interrelated and these children may reflect a genetic weakness or susceptibility to ectodermal defects.

Intratester reliability and intertester reliability are high for the variables measured in this study.

Dental research and treatment of handicapped children should be in greater depth regarding motor function, topography, tonicity of muscle and severity of the injury.

Lateral cephalometric radiographs and dental impressions can be taken on spastic cerebral palsy patients. Orthodontic and especially interceptive care can be evaluated for handicapped children on an individual basis.

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GOOD WATER

. . . Till taught by pain
Men really know not what good water's worth. . . .
Lord Byron

The effects of indomethacin on resorption and ankylosis in replanted teeth

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Root resorption and ankylosis are the most frequent complications of tooth replantation.[1-3] Previous investigations have focused on efforts to reduce these undesirable sequelae. The roles of several factors have been studied: periodontal membrane; status of pulpal tissue; degree of apical development; treatment of the root surface; extraoral time; and duration and method of splinting.[4-14] As a result of these studies, recommendations for optimizing the potential for successful replantation have been developed.[15] Unfortunately, ideal conditions for replantation rarely occur, and in many situations root resorption and ankylosis are likely postoperative complications and frequently result in tooth loss.[16] While the precise mechanism causing root resorption and ankylosis is not known, osteoclastic activity is usually a predominant feature.[17] This increased osteoclastic activity is initiated by the local release of biochemical mediators such as prostaglandins.[18] Indomethacin, a nonsteroidal, antiinflammatory analgesic, interferes with the action of prostaglandin synthetase.[19] In this way, prostaglandin is not produced and osteoclastic activity is reduced. The purpose of the present investigation was to determine whether indomethacin would decrease the amount of resorption and ankylosis after delayed replantation of teeth.

MATERIALS AND METHODS

Six dogs with intact, healthy, permanent dentitions were obtained through the University of Washington's Regional Animal Research Center. The animals were all about eighteen months of age. Four animals were randomly assigned to the experimental group and the remaining two comprised the control sample. The experimental animals were given indomethacin orally one hour preoperatively and remained on the medication throughout the study. Two dogs received 5 mg/kg of body weight, while the other two were given 1 mg/kg. Four incisors were extracted and replanted in each of the six animals to study the effects of indomethacin.

Surgical procedures

The animals were initially sedated with an intravenous injection of 15 mg/kg of thiamylal sodium. A surgical level of anesthesia was maintained with Halothane. Before the extractions were done, a clinical and radiographic examination was performed to identify any

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morbidity and to confirm apical closure of the roots. A #15 scalpel was used initially to incise the epithelial attachment. The teeth were then luxated with either a small straight elevator or Cryer elevators (#31 and #32). Finally, the teeth were removed from their sockets with pedodontic forceps (#150).

Immediately after extraction, each tooth was irrigated with normal saline to remove any hemorrhagic material. During subsequent procedures, the teeth were held by their coronal portions to minimize damage to the remaining periodontal fibers. Coronal access for endodontic therapy was achieved using a #1 round high- speed bur. The pulpal tissue was removed with a barbed broach and the canal was enlarged with Hedstrom files. After irrigation with sterile saline, each canal was dried with paper points and obturated by lateral condensation of gutta percha. Excess gutta percha was removed from the coronal portion of the tooth, and the access cavity was restored with composite resin. Each tooth was allowed to dry at room temperature, 68°F, until the time for replantation.

Replantation of each tooth occurred exactly one hour after its extraction. Immediately before replantation, the socket was irrigated carefully with normal saline to remove any clotted blood. Then the tooth was replanted, using gentle finger pressure. No difficulty was experienced in repositioning the teeth in their sockets. No difficulty was experienced in repositioning the teeth in their sockets. The replanted and adjacent teeth were cleaned with pumice, dried with air, and etched with 37 percent phosphoric acid gel, for one minute. The etched teeth were rinsed with water, and each tooth was dried with air for thirty seconds. Silux† enamel bond was applied to each tooth and cured for twenty seconds with a Visilux† light. A piece of .040-inch monofilament nylon was adapted to the labial surfaces of the teeth, fixed in position with a small amount of Silux enamel bond, and then strengthened with Silux composite resin. Each layer of material was cured individually with the Visilux light for thirty seconds.

Radiographs were taken to evaluate the root canal filling and the replantation procedures. The dogs were returned to their cages and maintained on a soft diet for two weeks. Postoperatively, the experimental group received the same dose of indomethacin that they had been given preoperatively. The dose was divided into equal morning and evening portions, in order to maximize continuous blood levels. Two weeks postoperatively, the dogs were sedated with acepromazine (1 mg/kg), and the splints were removed.

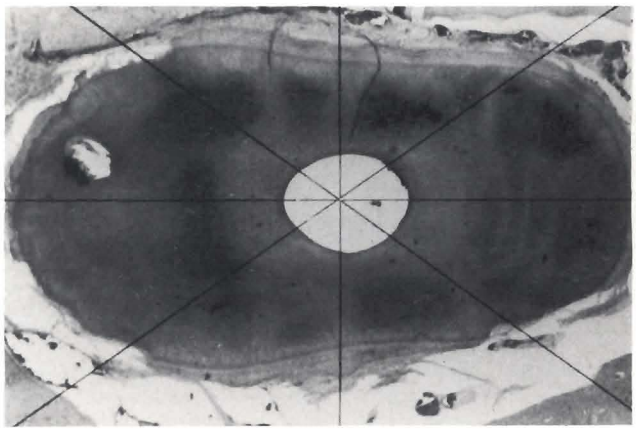


Figure 1. Grid used to establish points at which resorption was measured. The intersection of the radii with the root surface determined these points, and the depth of any resorption present was measured along the lines.

Analysis

At completion of the 90-day study period, the dogs were killed and the jaws were excised, fixed in 10 percent formalin, and decalcified in 5 percent formic acid and 4 percent hydrochloric acid. After double embedding in paraffin, blocks of the replanted and adjacent teeth were sectioned on a microtome perpendicular to their long axes. The resulting histologic sections were stained with hematoxylin and eosin. One experimental tooth from the dog receiving 5 mg/kg of indomethacin and one tooth from a control animal were prepared for scanning electronmicroscopic evaluation.

The sections which had been stained with hematoxylin and eosin were projected by a Leitz Microprojector onto a 200 mm grid screen. The resulting magnification was x 33. The grid was divided into a star shape by eight radii (Figure 1) and was oriented according to the labiolingual axis of the projected tooth root. Changes in root topography were noted at the intersection between the radii and the root surface. At each intersection point, the root surface was assessed for the presence of both ankylosis and resorption. In addition, the depth of resorption cavities was measured along the radius at that point. The total length of ankylosis around the root surface was also determined. The characteristics of the periodontal changes were classified as follows:

☐ Normal root surface, without any resorption.

†3M Dental Products Co., St. Paul, MN.

Table □ Characteristics of the sample.

Dog #	Tooth #	Dosage mg/Kg	Study period	Ulceration	Active resorption	Replacement resorption	Total resorption	Ankylosis
1	2	0	90 days	no	7.2	5.3	12.5	15.0
1	1	0	90 days	no	26.9	13.6	40.5	49.8
2	2	0	90 days	no	5.1	4.5	9.5	22.8
2	2	0	90 days	no	7.7	0.2	7.9	0
3	3	1	42 days	yes	8.8	2.0	10.8	2.0
3	2	1	42 days	yes	6.7	1.5	8.2	0
4	2	1	90 days	no	1.7	8.5	10.3	0
4	3	1	90 days	no	3.5	6.4	9.9	15.1
5	2	5/60d 1/30d	90 days	yes	0.6	0.3	0.9	122.1
5	3	5/60d 1/30d	90 days	yes	1.3	2.5	4.7	81.0
6*	2	5						

*Dog #6 died after 5 days.

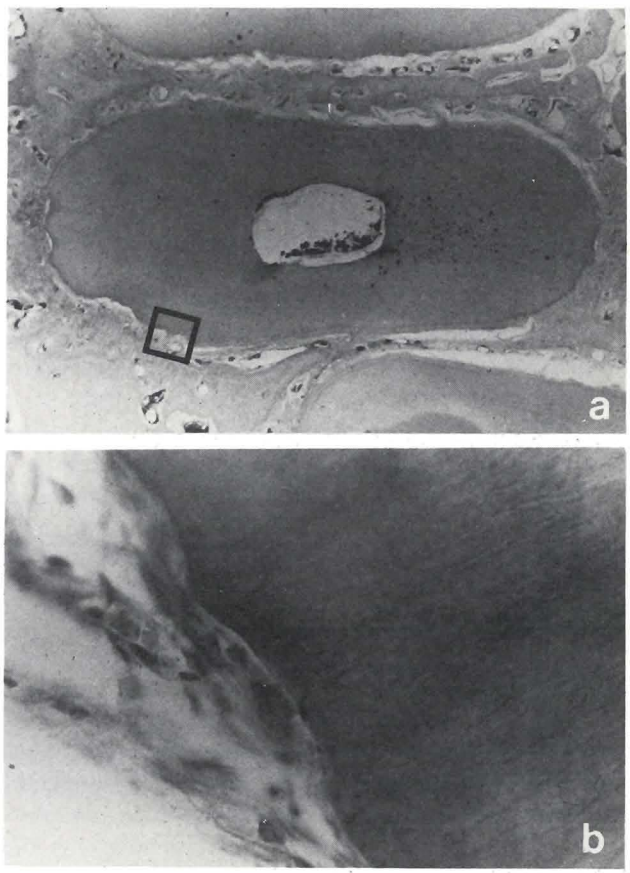
Figure 2. Photomicrographs of the incisor root from a control animal. a. This section shows a moderate amount of root resorption. The enclosed box is enlarged in B x 4. b. This magnified view shows an area of active resorption. The cementum has been resorbed, and the dentin has been invaded with the presence of multinucleated giant cells x 160. Hematoxylin and eosin.

- □ Active resorption, with a cavity present on the root surface.
- □ Placement resorption, where a resorption cavity has been filled in with osteoid tissue.
- □ Ankylosis, when the root surface and the surrounding bone were fused. Several histologic sections of two teeth from each dog were evaluated at 250-micron intervals along the length of the entire root. An average of nine sections were measured for each tooth. The mean index of resorption was calculated by dividing the total amount of resorption by the number of sections measured for that tooth. The scanning electronmicroscopic sections were photographed and the topography was analyzed qualitatively for the presence of resorption lacunae, areas of ankylosis, and normal root structure.

RESULTS

Systemic effects of indomethacin

Indomethacin was not tolerated well by the experimental animals. One dog that received 5 mg/kg died five days postoperatively from a fulminating infection secondary to a perforation of the stomach wall. The other dog receiving the same dose showed no effects until midway through the study period. At that time, it began to have bloody stools, suggesting that gastrointestinal complications had been induced by the drug therapy. That animal's dose of indomethacin was reduced to 1 mg/kg for the remaining 30 days of the study. At necropsy, all but one of the dogs receiving the drug showed severe gastrointestinal ulceration. The control animals had no abnormal gastrointestinal signs or symptoms.



Effects of indomethacin on resorption

The amount of resorption found in the dog receiving 5 mg/kg initially differed from both the control animals and from the dogs receiving 1 mg/kg (Table). In the control animals, the resorption sites showed active root resorption (Figures 2a and 2b) and an inflammatory

infiltrate with multinucleated giant cells. The experimental animals that received 1 mg/kg had a similar amount of root resorption (Figure 3a), but showed more replacement resorption when compared with the controls (Figure 3b). Osteoblastic type cells were found lining the surfaces of the lacunae. The other experimental animal that received the low dose of indomethacin died after forty-two days. Active inflammatory root resorption was the most predominant histologic finding in this animal. In direct contrast, the dog which received 5 mg/kg for sixty days and 1 mg/kg for thirty days had the least root resorption of all animals (Figure 4a). In the latter animal, the majority of the resorptive areas showed a pattern of repair and osteoid deposition.

Effects of indomethacin on ankylosis

Small sites of root ankylosis were noted in both the control animals and in the dogs receiving 1 mg/kg. These areas of ankylosis were usually found where previous resorption had occurred. The animal that received the higher dose of indomethacin, however, has extensive root ankylosis, but most of these areas were not associated with resorption (Figure 4b).

Similar results were obtained from the SEM evaluation. The tooth from the control animal showed resorption lacunae on the root surface, along with areas of ankylosis where the bone extended into the tooth structure. In contrast, the tooth from the dog that received the higher dosage of indomethacin had multiple areas of ankylosis, which extended from the perimeter of the root surface into the adjacent bone. Less external root resorption, however, was noted on the root surface. Extensive ankylosis in this animal made it difficult to see all of the root surface.

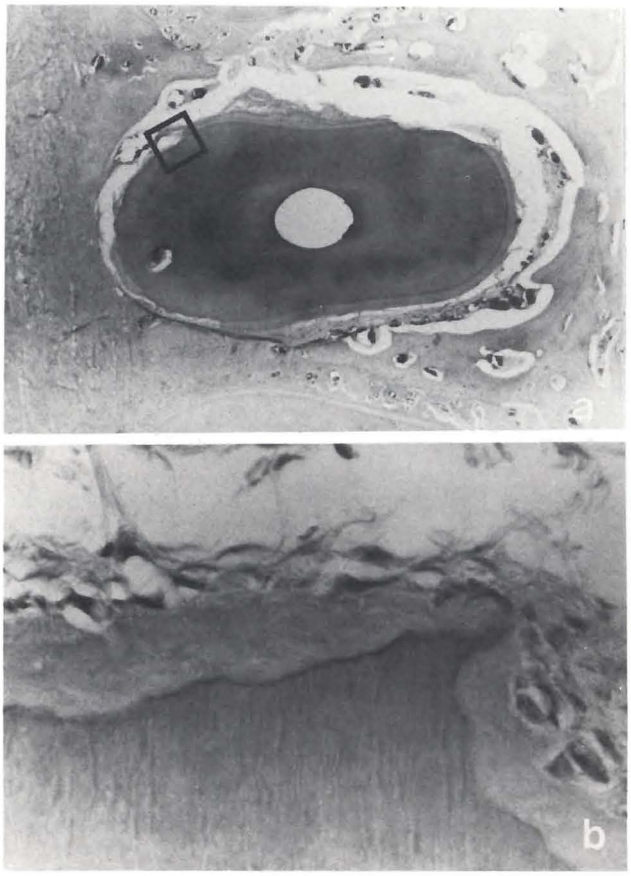


Figure 3. Photomicrographs of the incisor root from an experimental animal that received 1 mg/kg of indomethacin. a. Several areas of the root have resorbed. In other areas, the resorption has been accompanied by secondary deposition of cementum. The enclosed box is enlarged in b x 4.

DISCUSSION

Although the sample size was small, the experimental methodology in this study was successful in predictably creating root resorption. The reduction in resorption seen in the animal receiving the higher dosage of indomethacin may have been due to the inhibition of prostaglandin production. Previous studies have focused mainly on the role of prostaglandins in the resorption of bone and on ways to inhibit that process with indomethacin.[20] The precise mechanism by which inhibition occurs is unknown, but reduction of osteoclastic activity is believed to be the most likely reason. It has been suggested that the precursors of prostaglandins are the lipids which constitute cell membranes.[21] Mechanical stress, for example through orthodontic tooth movement, ruptures these membranes and results in the formation of prostaglandins. A similar release could be caused by the trauma of tooth extraction. The way in which prostaglandins play a role in the production of osteoclasts is still unknown, although cyclic AMP and intracellular calcium are believed to be involved in the process.[19] The application of bone research to the process of tooth resorption, however, may be misleading. It has been shown that dental tissues show greater resistance to vascular invasion than does bone.[22] Since osteoclastic mediated resorption is usually preceded by angiogenesis, a possible explanation for the reduction in resorption may be the increased inhibition of vascular invasion brought about by the indomethacin. Whether or not this is a direct consequence of prostaglandin reduction is speculation.

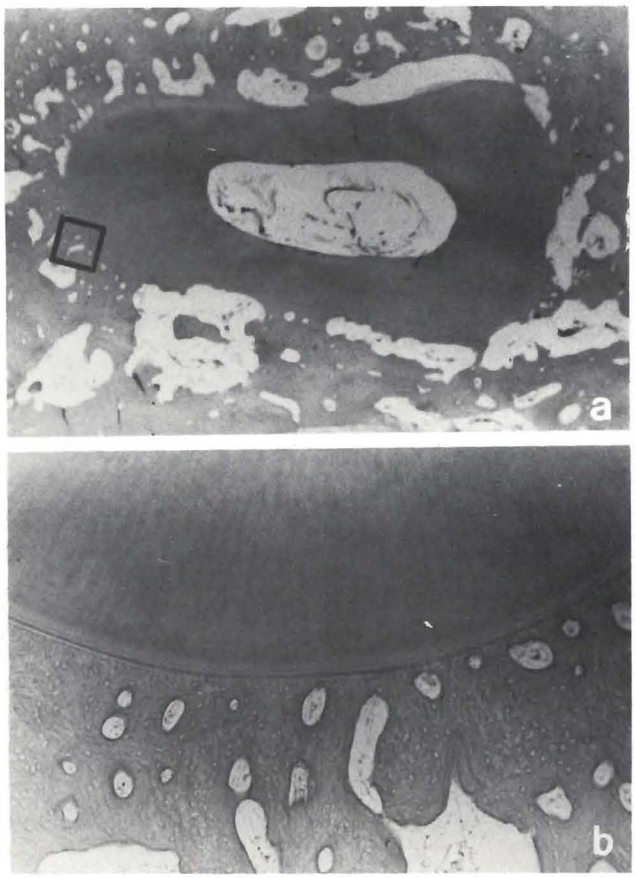


Figure 4. Photomicrographs of the incisor root from the experimental animal that received 5 mg/kg of indomethacin. a. Although extensive ankylosis has occurred, the root surface shows minimal evidence of resorptive activity. The enclosed box is enlarged in b x 4. b. In this magnified view of the root surface, the cementum has fused to the bone with no apparent evidence of previous resorptive activity x 160. Hematoxylin and eosin.

Ankylosis is frequently found in replanted teeth. The usual pattern of root ankylosis is a cyclical process of active resorption followed by healing with osteoid tissue.[23] Elimination of the periodontal ligament space and consequent fusion between the root and bone are usual sequelae and, in time, the whole root may be remodeled and replaced by bone. The reduction in resorption seen in the dog receiving the highest dose of indomethacin in the present study was unique, and the multiple sites of root ankylosis were surprisingly not associated with active resorption. A possible explanation for this might be that inhibition of the inflammatory response allowed osteoblastic activity to predominate. Hence in areas where bone contacted tooth surface, fusion was permitted. This healing process is similar to that which occurs following intraoral use of titanium implants.[24] Histologic examination of clinically stable implants shows remodeled bone in close proximity to the implant surface. Nonmineralized connective tissue is not seen between implants and bone. Obviously, a longer study period would determine the ultimate fate of those replanted teeth which show a similar histologic relationship. The fact that indomethacin has been shown to interfere with continuous bone remodeling may indicate that the replants might be inert on a long-term basis.

The destructive effect of indomethacin on the gastrointestinal tracts of dogs and other animals has been documented previously.[25] Researchers believe that passage of food through the gastrointestinal tract mechanically stimulates the mucosa and causes the intramural synthesis of prostaglandin, which in some way protects the mucosa.[18] Removal of this protective factor by the inhibition of prostaglandin synthesis results in ulceration of the gastrointestinal tract. A dose of 1 mg/kg is supposedly compatible with both prostaglandin inhibition and continued health of the enterohepatic system. Severe ulceration was seen, however, even in the animals with the lowest doses in the present investigation. Related drugs, such as ibuprofen, have similar ulcerogenic properties, with the side effects paralleling their potency.[26] New nonsteroidal, antiinflammatory drugs with reduced ulcerogenic side effects may prove to be of value in future research.

The encouraging results which have been obtained from this initial research warrant further investigation into this area. Possible avenues of investigation might include the effects of the newer, less toxic nonsteroidal, antiinflammatory analgesics on root resorption, when administered both locally and systemically. The clinical implications of success in this area may someday improve the long-term prognosis for replanted teeth, in addition to providing a possible solution to excessive root resorption, occasionally encountered during orthodontic treatment.

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WATER'S USE

An automobile coming off the assembly line represents the expenditure of at least 30,000 gallons (113 kl) of water—20,000 needed to produce its ton (0.9t) of steel, and 10,000 (38kl) more used during the actual assembly process. Many thousands more are involved in the manufacture of its plastics, glass, fabrics and other parts. Every gallon (3.8 l) of gasoline poured into the tank may represent as much as another 70 gallons (265 l) of water, utilized in refining.

Statistics like these could be prepared for every amenity of civilized society—for the food we eat, the clothes we wear, even the books we read and the television we watch. For water is the lifeblood of industry, its most essential material. No other substance except air flows in such volume through the factories of the industrialized world. Water is a source of power, either directly in hydroelectric plants, or indirectly as steam. It supplies the warmth that radiates from many heating systems, and in steel mills its coolness quenches glowing metal. It is a raw material in chemicals, beer, pharmaceuticals and hundreds of other products. It is the solvent in which chemical reactions take place in the manufacture of bleaches, and it washes impurities from pulp in paper mills. Via streams and rivers, it carries off many thousands of tons of industrial waste daily.

Leopold, L.B. and Davis, K.S.: Water.
Alexandria, VA: Time-Life Books, 1980, p 145.

Diagnosis of developmental dental anomalies using panoramic radiographs

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Early detection and diagnosis of dental anomalies are essential steps in the evaluation of the child patient and in treatment planning. These procedures require detailed medical and dental histories, thorough clinical examination and the use of radiographs.[1] Anomalies such as hypodontia and supernumerary teeth cannot be confirmed without a radiographic survey; there is an ongoing debate, however, as to the most suitable and efficient radiographic method for this purpose.[2-6]

Genetic and ethnic differences have been described for various dental anomalies, especially hypodontia.[7,8] Thus, results obtained for different populations cannot be applied universally. In Israel, only one radiographic survey has been made, using children and young adults, while two other investigations used radiographs only upon clinical suspicion of anomalies.[8-10] It was decided, therefore, to investigate a young population using panoramic radiographs in order to verify the findings of dental anomalies in this population and to compare them to findings elsewhere.

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METHODS AND MATERIALS

Panoramic radiographs† of 702 children, 328 males and 374 females, five to twelve years of age, treated at the Tel Aviv University children's clinic between the years 1978-1983, were evaluated (Table 1). Radiographs were made, following complete medical and dental histories and a thorough clinical examination.

The radiographs selected were of good diagnostic value and were examined separately by all the authors,

†Simmens Orthopantomograph, Model 30P, 55-60 kvp, 15mA. 3M cassette films 15 x30 cm with intensifying screens.

Table 1 □ Age distribution of the children examined.

Age	Number of children
5-	24
6- 7	46
7- 8	191
8- 9	237
9-10	135
10-11	50
11-12	19
Total	702

Table 2 □ Number and percentage of children with hypodontia of permanent teeth.

	Total no. of children	Total no. of children with hypodontia	Percentage with hypodontia
Males	328	32	9.7
Females	374	24	6.4
Both sexes	702	56	8.0

Chi square 2.65 at 1df $p > 0.1$. not significant.

Table 3 □ Number and percentage of children with hypodontia with respect to the number of congenitally missing teeth.

No. of congenitally missing teeth per individual	No. of males with hypodontia	Percentage of males with hypodontia	No. of females with hypodontia	Percentage of female with hypodontia	Percentage in both sexes
1	18	56	7	29	45
2	8	25	9	38	30
3	1	3	5	21	11
4	5	16	3	12	14

Chi square 7.7 at 3 df $p < 0.1$. not significant.

using the "Star" panoramic x-ray viewer. The following dental anomalies were recorded:

- □ Anomalies of number: hypodontia or supernumeraries of the permanent dentition. Hypodontia was recorded only after the possibility of premature extraction was ruled out.
- □ Anomalies of shape: peg-shaped laterals, gemination, fusion, dens invaginatus, taurodontism and dilaceration.
- □ Anomalies of position: malpositions of the teeth were divided according to Stafne and Cibilisco into mesioangular, distoangular, horizontal and transverse.[11] Inclination of less than 10° was considered as normal. In addition, migration and rotation were recorded. Migration was defined as a change in position of the tooth germ a distance of more than its mesiodistal diameter. Rotation was defined as a turn of 90° of the tooth germ.
- □ Stafne cyst: the lesion appears as an ovoid radiolucency situated between the mandibular canal and the inferior border of the mandible, anterior to the angle.[12]

Third molars were excluded from the study because of the young age of the population.

All findings were recorded in relation to the region in which they were found: anterior, premolar and molar areas. The chi-square test was used for significance of differences between frequencies.

RESULTS

The main anomaly found was hypodontia: 56 out of 702 (8.0 percent). The prevalence in males was 9.7 percent and in females 6.4 percent (Table 2); this difference, however, was not statistically significant ($p > 0.1$).

More males showed only one missing tooth, while more females showed two or more missing teeth (Table 3). These differences were also not significant ($p < 0.1$).

The second mandibular premolar and the maxillary lateral incisor were the teeth most often missing. Less frequently missing were the maxillary second premolar and the mandibular second molar (Table 4).

Fifty-five percent of the children with hypodontia had more than one tooth missing. The average number of missing teeth in the hypodontia group was 2.05. Bilateral hypodontia was found in 51.3 percent of radiographs. No dominance of any side was noted (Table 5).

Anomalies, other than hypodontia are listed in Table 6. All supernumerary teeth were in the premaxillary area. All the teeth with microdontia were peg-shaped lateral incisors. Two instances of fusion were noted: both were fusion of a primary lower lateral incisor to a canine. Three radiographs showed Stafne cyst, two were bilateral and one unilateral.

DISCUSSION

The relatively high prevalence (8.0 percent) of hypodontia found in this population is one of the highest reported in the literature (Table 7) and is higher than previous studies performed in Israel.[13-30] Differences between survey results can arise from different sampling methods, size of the population, distribution of sexes and ages, and the use of radiographs.[1] One of the reasons for the higher prevalence could be the younger population used in this study. Tooth germs of second premolars and second molars cannot always be discerned in young children, whereas more than a third of the children in

Table 4 ☐ Number and percentage of hypodontia by teeth.

Tooth	No. missing in males	Percentage missing in males	No. missing in females	Percentage missing in females	Total no. missing	Percentage missing in both sexes
2nd mandibular premolar	12	21	20	34	32	28
Lateral maxillary incisor	19	33	12	21	31	27
2nd maxillary premolar	5	8.5	8	14	13	11
2nd mandibular molar	6	11	8	12	13	11
Lateral mandibular incisor	6	11	4	7	10	8
Central mandibular incisor	3	5	4	7	7	6
2nd maxillary molar	2	3.5	2	3	4	3
Maxillary canine	2	3.5	0	0	2	2
Mandibular canine	2	3.5	0	0	2	2
1st Mandibular premolar	0	0	1	1.5	1	1
Total	57	100	58	100	115	100

Table 5 ☐ Prevalence of unilateral and bilateral hypodontia.

Tooth type	Right side affected	Left side affected	Both sides affected
2nd mandibular premolar	5	9	9
Lateral maxillary incisor	5	4	11
2nd maxillary premolar	4	1	4
2nd mandibular molar	1	0	6
Lateral mandibular incisor	1	3	3
Central mandibular incisor	1	2	2
2nd maxillary molar	0	0	2
Maxillary canine	0	0	1
Mandibular canine	0	0	1
1st mandibular premolar	0	1	0
Total	17	20	39

Table 6 ☐ Distribution of developmental anomalies other than hypodontia.

Anomaly	Maxilla			Mandible			Total no. of teeth affected	Total no. of children affected	Percentage of children affected
	Front	Premolar	Molar	Front	Premolar	Molar			
Supernumerary teeth	10	—	—	—	—	—	10	9	1.28
Microdontia	7	—	—	—	—	—	7	6	0.85
Dens in dente	4	—	—	—	—	—	4	4	0.57
Fusion	—	—	—	2	—	—	2	2	0.28
Taurodontism	—	2	12	—	—	10	24	7	1.0
Mesioangular	8	24	1	3	6	1	43	32	4.55
Distoangular	1	6	—	—	32	—	39	29	4.13
Horizontal	3	—	—	—	—	—	3	2	0.28
Migration	2	5	—	2	—	8	17	13	1.85
Transverse	—	2	—	—	—	—	2	2	0.28
Rotation	123	116	—	45	16	—	300	198	28.2
Malformed roots	4	—	3	1	—	—	8	7	1.0
Hypoplasia	8	—	4	2	—	4	18	5	0.71
Staphne cyst	—	—	—	—	—	—	—	3	0.42

Table 7 ☐ Comparison of findings of hypodontia in various populations (by ascending order).

Investigator	Year	Country	Sample size	Sample age	Percentage hypodontia	Examination Clinical	Examination Radiographic
Rosenzweig[10]	1965	Israel	28,000	6-14	0.3	+	–
Brekhus[13]	1944	U.S.A.	11,487	All ages	1.6	+	–
Rothenberg[14]	1939	U.S.A.	1,000	3-15	2.3	+	–
Byrd[15]	1943	U.S.A.	2,838	4-14	2.8	+	+
Dolder[16]	1937	Switzerland	10,000	6-15	3.4	+	–
Buenviaje[17]	1984	U.S.A.	2,439	—	3.7	+	+
Brown[18]	1957	U.S.A.	5,276	6-15	4.3	–	+
Rose[19]	1966	England	6,000	7-14	4.3	+	+
Gimmes[20]	1964	Norway	36,000	School-children	4.5	+	–
Eidelman[8]	1973	Israel	21,384	12-18	4.6	+	–
Glenn[21]	1964	U.S.A.	1,702	6-15	5.1	+	+
Hermel[9]	1971	Israel	2,123	6-25	5.3	+	+
Grahnen[22]	1956	Sweden	1,006	11-14	6.1	+	–
Horowitz[23]	1966	—	1,000	7-16	6.5	+	+
Thompson[24]	1974	Canada	1,191	6-12	7.4	+	+
Maklin[25]	1979	U.S.A.	913	4-13	7.5	+	+
Locht[26]	1980	Denmark	704	9-10	7.7	+	+
Magnusson[27]	1977	Iceland	1,116	8-16	7.9	+	+
Haavikko[28]	1971	Finland	1,041	5-13	7.97	+	+
Present study	1985	Israel	702	5-12	8.0	+	+
Volk[29]	1963	Australia	15,294	6-15	9.6	+	–
Hunstadbraten[30]	1973	Norway	1,295	School-children	10.0	+	+

this survey were less than eight years old.[11,31]

Of the anomalies investigated, only hypodontia showed an outstanding result. All other conditions were within the range of previously reported data. Hypodontia of more than one tooth was manifested in 55 percent of the population; 51 percent were missing bilaterally. This implies that a diagnosis of a missing tooth always requires further clinical and radiographic evaluation.

No significant differences were found between males and females in prevalence or in the number of missing teeth per person. This is in accordance with the results of Davies, Boruchov and Grahnen while Rose, Glenn, Horowitz and Thompson, reported more missing teeth per person in females.[19,21-24,32,33]

The two teeth most often missing were equally the second mandibular premolar and the maxillary lateral incisor. Some investigators, however, showed the lateral incisor, while others found the second mandibular premolar to be absent more often.[10,13-15,19,20,22,26,27,34]

Supernumerary teeth

Our finding of 1.28 percent is in the range of most other reports (Table 8).[35-46] The very low prevalence found by Rosenzweig was probably due to the fact that no radiographs were used.[10] On the other hand, Lacoste and Parry surveyed children who were referred for orthodontic treatment and found a much higher prevalence.[45,46]

All the teeth were in the premaxillary area where most supernumerary teeth were reported to be found.[12]

Dens invaginatus

Dens invaginatus was noted in four children (0.57 percent). Amos, Brevik and Grahnen reported much higher prevalence of this condition using periapical radiographs for the diagnosis, which is a more suitable method.[22,47,48]

Taurodontism

The diagnosis of this condition can be difficult in young children as the roots have not yet completed their development. Further difficulties originate from the panoramic technique itself. Certain areas might become distorted and resemble taurodontism.[49] In our survey, 1.0 percent of the children showed unquestionable taurodontism. Shifman *et al* showed 6.9 percent in a young adult Israeli population.[50] The difference might arise

Table 8 ☐ Comparison of findings of supernumerary teeth in different populations (by ascending order).

Investigator	Year	Country	Percentage supernumerary
Rosenzweig[10]	1965	Israel	0.1
Boyne[35]	1958	U.S.A.	0.3
Buenviaje[17]	1984	U.S.A.	0.46
Wallfeldt[36]	1961	Sweden	0.5
Frome[37]	1977	U.S.A.	1.0
Schulze[38]	1960	Germany	1.0
Present study	1985	Israel	1.28
Morris[39]	1969	U.S.A.	1.4
Billberg[40]	1965	Sweden	1.4
McKibben[41]	1971	U.S.A.	1.5
Jarvinen[42]	1976	Finland	1.66
Locht[26]	1980	Denmark	1.7
Clayton[43]	1956	U.S.A.	1.9
Luten[44]	1967	U.S.A.	2.0
Parry[45]	1961	India	2.5
Lacoste[46]	1962	France	2.8

Figure 1. A panoramic radiograph of an eight-year, three-month-old male, demonstrating unilateral hypodontia of the right second mandibular premolar.

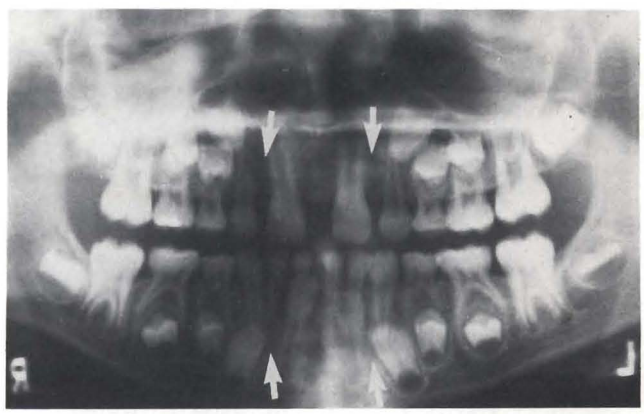

Figure 2. A radiograph of an eight-year-old male. All lateral incisors are missing.

from the higher age-group and the use of periapical radiographs.

Anomalies of position

Evaluation of the radiographic data did not contribute toward a more accurate diagnosis. Malposition of teeth before eruption did not necessarily imply malposition in the arch. Upon eruption, the teeth might align into correct position.[51] Furthermore, the distortion produced occasionally by the panoramic method might also contribute to a false positive or false negative diagnosis.[49]

Panoramic radiographs are the method of choice for diagnosing anomalies in number. They are inferior to periapical surveys in diagnosing Dens invaginatus, taurodontism and anomalies of position.

The panoramic radiograph will yield more accurate results, and should be used mainly, therefore, in children older than eight to nine years, when most tooth buds, including third molars, should be discernible (Figures 1-6).

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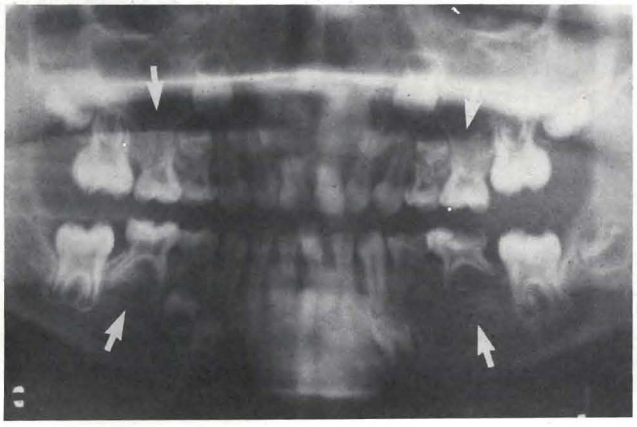

Figure 3. A radiograph of a 7.5-year-old female with hypodontia of the four second premolars. Additionally, note the absence of the right second mandibular molar.

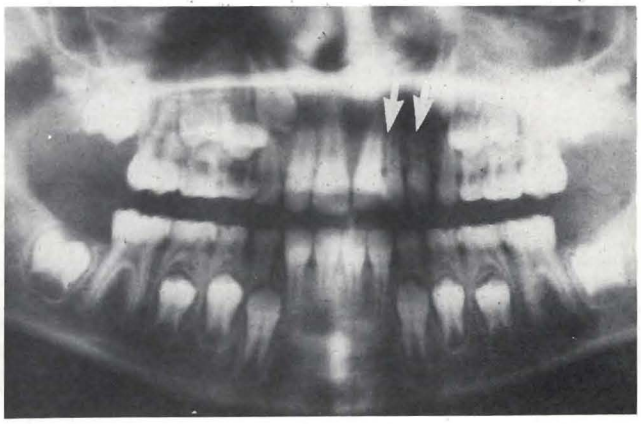

Figure 4. A radiograph of a nine-year-old female, with twinning of the left maxillary lateral incisor.

Figure 5. A radiograph of an eight-year-old female, with a peg-shaped right maxillary lateral incisor.

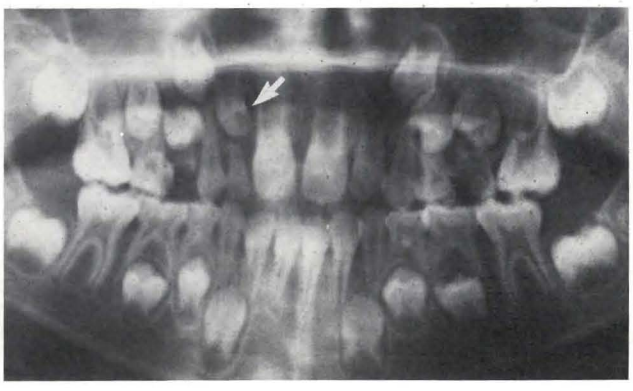

Figure 6. A panoramic radiograph of an 8.5-year-old male showing dens invaginatus of the right maxillary lateral incisor.

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Iron and exercise interactions

Nutrition

Jackie Puhl, PhD

Increased participation in physical activity has promoted interest in research on interactions between nutrition and exercise. Good nutrition is important for optimal performance in many physical activities. Some nutritional deficiencies, such as iron deficiency, can negatively affect training and performance. With extreme iron deficiency (anemia), decreases in maximal oxygen uptake, work capacity and endurance time have been observed.[1,2]

ROLE OF IRON IN EXERCISE

Large amounts of energy are used during strenuous muscular exercise. Aerobic metabolism (use of oxygen) contributes significantly to the energy production required in most physical activities, particularly endurance exercise. Thus, oxygen supply to working muscles and oxygen utilization by muscles are important in performance of long-term submaximal exercise. Iron plays a role in both oxygen transport to muscles (circulation) and oxygen utilization within muscles (aerobic metabolism).

Almost all (98 percent) of the oxygen transported in blood is carried by hemoglobin (Hgb) in red blood cells (RBC). Within muscles, iron-containing myoglobin helps transport oxygen across the cell to mitochondria. It is here that most of the adenosine triphosphate (ATP),

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which provides the energy for muscle contraction, is produced. In the mitochondria, other iron-containing substances (cytochromes, enzymes) are required for aerobic metabolic processes involved in energy production. Thus, iron status may be important to performance through effects at either circulatory or metabolic levels.

IRON BALANCE

Because iron is important in oxygen transport and utilization, it must be available for formation of Hgb and iron-containing substances in muscle and other cells. Both iron stores act as a reservoir to ensure iron availability. Numerous factors may increase demands on body iron stores. Among these are growth, pregnancy, lactation and blood loss. Men typically have over twice as much iron stored as women. Many women (20 percent - 30 percent) have scant or no iron stores as a combined result of low iron (caloric) intake and high iron losses from menstruation.[3]

Maintenance of iron stores and availability of iron depends on the balance between dietary iron absorption and iron losses. Individuals with limited iron reserves, mainly women, are in precarious iron balance and at risk when iron intake diminishes (as in dieting) or when normal iron losses are increased.

Iron intake and absorption

Iron intake varies with the number of calories ingested (about 6 mg iron/1000 kcal) and iron content of foods consumed.[3-5] Caloric intakes of most men allow them to meet their Recommended Dietary Allowance (RDA) of 10 mg iron/days.[6] However, women who take in fewer than 3000 kcal/day may have difficulty meeting their higher RDA of 18 mg iron/day.[6]

While many athletes have higher than average caloric (and iron) intakes to balance energy expenditure, some limit caloric and/or iron intake to lose weight or because they avoid red meats and consume vegetarian (non-heme) diets. Caloric restriction is thought to be more common among female athletes. Most women, including athletes, consume insufficient amounts of iron to meet their iron requirements.[6-9] Even when mean iron intake value for a group of athletes is equal to or above theorized iron requirements, many individuals are below the group mean and in negative iron balance.[10]

Iron absorption is regulated primarily by amount of iron stored and rate of RBC production. Absorption can also vary with type of food (heme or non-heme iron) consumed and can be enhanced or depressed by other components in the diet. Because iron stores, iron needs and diet vary between individuals, iron absorption also varies (usually 5 percent - 25 percent).[3-5] Typical absorption of iron is about 10 percent of the iron ingested.[3-5] Limited information on iron absorption and training indicates lower iron absorption rates in male and female distance runners compared to controls.[11,12]

Iron losses

Red blood cell breakdown is a potential source of iron loss. However, most iron from daily RBC breakdown is recaptured and reused. Iron losses (about 1 mg/day for men and 1.5 mg/day for women) normally occur in sweat, feces and urine.[3] Additional iron losses of women (0.5mg/day) because of menstruation vary considerably.

Sweat is normally considered a negligible route of iron loss. However, profuse sweating may result in 0.4-1.0 mg iron lost per day.[13] Thus, iron loss in sweat during strenuous training may considerably increase total iron loss.[13-15]

There is also evidence of enhanced RBC breakdown with some types of training (mainly running and marching).[16] Since much of the iron from RBC breakdown is recycled, however, it is difficult to assess the importance of increased RBC breakdown on iron loss.

Recently, Nickerson, *et al*, calculated iron losses of 2.7 mg iron/day for eight young women runners.[9] Ehn, *et al*, reported iron losses in male distance runners which were higher than normal and the runners used iron about twice as fast as the normal adult male.[11] Causes of faster iron turnover are theorized to be related to increased RBC destruction and/or increased loss of iron in sweat. Increased gastrointestinal blood loss associated with prolonged strenuous exercise has also been observed.[17-20] Large iron losses from various sources could ultimately affect iron status and nutritional iron requirements.

INFLUENCE OF TRAINING ON IRON STATUS

Red cell iron

The term "sports anemia" has been used to describe both (1) decreases in RBC count, hematocrit (Hct) and Hgb concentration observed in training studies and (2) low- normal (or suboptimal) values of these hematological indices in descriptive studies of athletes.[16,22] "Sports anemia" is not clinical anemia because the hematological values are within normal ranges and decreases with training are relatively small. Furthermore, the

RBCs tend to be of normal size (normocytic) and contain the normal amount of Hgb (normochromic) – conditions not seen in iron-deficiency anemia.

Evidence regarding training effects on Hgb concentration and RBCs in humans is contradictory. Some studies have shown no changes in Hgb or RBCs when pre- and post-training samples were compared, whereas others have shown decreases with training, especially when large or sudden increases in training intensity or duration occur.[16-22] Such decreases in hematological variables appear to be transient with Hgb concentration and RBCs returning to initial levels later in training.[16] Distance running is most often studied in relation to RBCs, Hct and Hgb concentration and is one activity in which most changes are observed.

Although most RBC values reported for a variety of athletes fall well within normal ranges, some studies reported lower Hgb and Hct values in athletes, especially female athletes, compared to less active populations.[16,18,22,23] Endurance athletes, mainly runners, have a higher prevalence of low-normal hematological values than other athletes.[16,18,22,23] Because oxygen-carrying capacity is reduced when Hgb is low, these low-normal range Hgb values are considered "suboptimal" for peak performance in some activities.[22]

Explanations for low-normal hematological values or decreases with training include (1) increased plasma volume (hemodilution), (2) increased RBC destruction, and (3) decreased RBC production.[16] Although larger than normal blood volumes which could produce hemodilution have sometimes been reported for endurance-trained individuals, increase in plasma volume with training is not a universal finding.[24] Also, plasma volume increase can not completely account for the amount of change in many blood variables noted with training nor the fact that concentrations of some variables increase while others decrease. There is evidence of increased RBC destruction with training which may be due to physical trauma, rapid circulation, mechanical compression, elevated body temperature, or changes in blood chemistry (acidity, catecholamines, metabolites).[16-18] It is suggested that "sports anemia" is a normal physiological adaptation induced by the low partial pressures of blood oxygen during strenuous exercise resulting in increased 2,3- diphosphoglycerate (2,3-DPG), decreased erythropoietin, decreased RBC production and, ultimately, setting of Hgb and Hct at a lower level.[23]

Iron transport

Data on effects of training on iron transport variables (serum iron SeFe, total iron-binding capacity TIBC and percent transferrin saturation percent Sat) are controversial and inconclusive because SeFe and TIBC are influenced by several factors including infections and diurnal variation. Low percent Sat values (below 20 percent) are found more often in athletes (especially female athletes) compared to the normal population.[16,22] Implications of a low percent Sat value for performance in sport are not clear. In reviewing animal data, Dallman suggested that "impaired transport of iron by transferrin can restrict production of some heme proteins in skeletal muscle to a proportionally similar degree as Hgb.[25] Impaired iron transport, therefore, could have a negative effect on oxygen utilization in tissues as well as oxygen-carrying capacity.

Iron stores

Measures of ferritin, free erythrocyte porphyrin and bone marrow biopsies provide information about iron stores. Several studies indicate low iron stores occur more among athletes, than in the average population.[7,9,11,23,26-29] Iron cost associated with training would increase iron withdrawal and diminish iron stores. Reduction of iron stores during training has been observed in some athletes.[8,10]

IMPLICATIONS FOR PERFORMANCE

A negative iron balance from combinations of increased iron need, low iron intake, and low iron stores could ultimately lead to iron deficiency. Iron deficiency can result in decreases in Hgb level and consequently oxygen- carrying capacity of blood, e.g., a decrease in Hgb level from 15 g/dl to 14 g/dl can decrease oxygen-carrying capacity from 20.1 to 18.8 cc of oxygen per 100 ml blood. The effects of small decreases in Hgb and oxygen-carrying capacity on aerobic performance are not well documented because of compensatory mechanisms which occur to increase oxygen delivery to tissues (increase in cardiac output) and enhance oxygen extraction at the tissue level (increased 2,3 DPG).

There is apparently no correlation between performance and Hgb concentration in homogenous groups of athletes in the same sport.[16,30] Nevertheless, small decreases in oxygen-carrying capacity could affect performance in some activities. Also, the usual response to a reduced Hgb concentration is enhanced erythropoietic activity to increase RBC production. This can increase withdrawal of iron from storage and exacerbate an iron-deficiency condition.

Even without a reduction in oxygen-carrying capacity, iron deficiency could negatively affect performance

through factors associated with metabolism, i.e., through effects at the tissue level. In animal studies, iron deficiency diminished concentrations of myoglobin and cytochromes which are involved in aerobic metabolism.[31] When Hgb concentrations and oxygen- carrying capacities of iron-deficient rats were returned to near normal by red cell infusion, treadmill endurance was still significantly impaired and post-exercise lactic acid levels were elevated.[32] Thus, correcting oxygen- carrying capacity but not iron deficiency did not improve tissue aerobic metabolism. Iron therapy of borderline iron-deficient women resulted in lower maximal lactic acid production but no increase in maximal oxygen consumption.[33] This suggests that correcting iron deficiency improves muscle aerobic metabolism.

According to Dallman, diminished oxygen-carrying capacity and iron deficiency have separate effects on physical performance: oxygen-carrying capacity affects peak work loads attained in short intense exercise (maximal aerobic power and work capacity), whereas muscle oxygen utilization is particularly critical for submaximal exercise for prolonged periods of time (endurance).[25]

CONCLUSION

Adequate iron intake is particularly important for individuals who train strenuously and also have relatively low iron intakes or are in precarious iron balance. Recreational or competitive athletes should monitor dietary intakes, iron-related blood variables and training to evaluate need for training modifications and/or iron supplementation. Although iron supplementation does not improve performance in iron-replete individuals, it may be valuable in helping maintain iron balance during training.[9,10,16,34]

Further research is needed to help identify prevalence of iron deficiency in a variety of training populations, to clarify their iron requirements and determine appropriate interventions for risk-prone individuals. Focus on iron intake, absorption, losses and stores with training will help explain the relationship between training and iron nutriture.

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Lymphangiomas of the alveolar ridge in a neonate: report of case

Case reports

Paul E. Kittle, DDS; LTC, DC
Robert M. Weaver, DDS; CPT, DC

Lymphangiomas of the alveolar ridge in neonates have been identified in several studies.[1-6] These lesions are described as being blue, domed, fluid-filled lesions occurring on the maxillary and mandibular posterior dental ridges. All lesions identified as neonatal lymphangiomas in the Jorgenson *et al* study of 2,092 infants occurred in black neonates, with an occurrence rate of 3.6 percent. No lesions were found in white neonates.

Differential diagnostic conditions that should be considered are natal teeth, epstein pearls, dental laminal cysts, Bohn's nodules, mucous retention cysts, eruption cysts and hemangiomas.[7-9] Conventional treatment for neonatal lymphangiomas has been surgical removal.[2,3,11,12] Marsupialization, treatment by cryoprobe, and spontaneous regression have also been reported.[3,4,7,9,10] The purpose of this paper is to present the identification and treatment of two intraoral lesions in a thirteen-day-old child.

CASE REPORT

A newborn black male was referred to the Pediatric Dentistry service after examination by the Community Health Nurse. The mother was concerned about "bumps on the gums" which has been present since birth.

At the time this report was gathered, LTC Kittle, Chief, Pediatric Dentistry and CPT Weaver were assigned to the 766th Medical Detachment, Baumholder, West Germany, APO 09034.

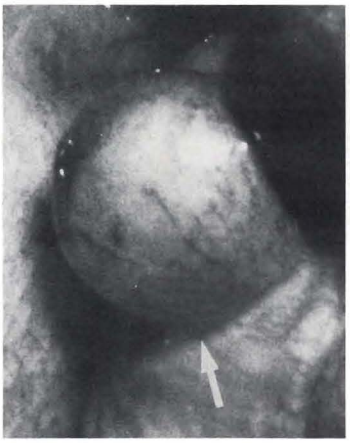

Figure 1. Alveolar ridge lymphangioma in the maxillary right quadrant.

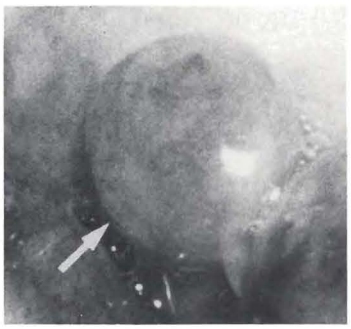

Figure 2. Alveolar ridge lymphangioma in the mandibular left quadrant.

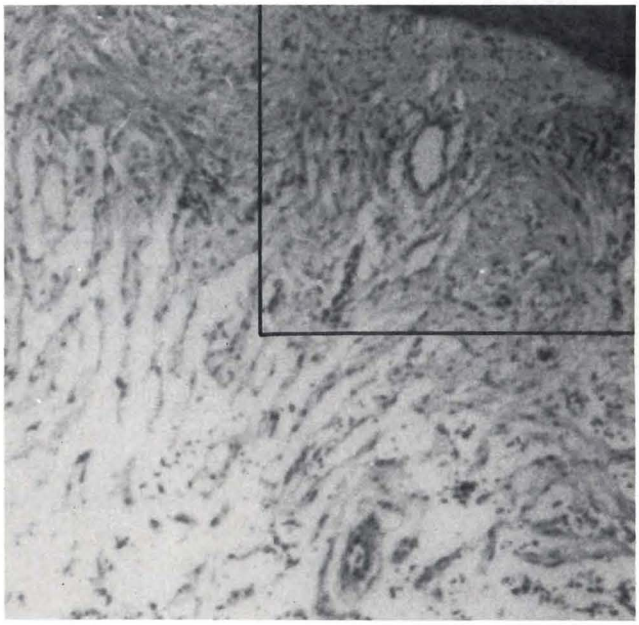

Figure 3. Histological section shown in low power. Boxed area is shown in medium power, in Figure 4.

The patient was a well-developed, well nourished, thirteen-day-old black male with an unremarkable medical history. Intraorally, the neonate presented with two blue, dome-shaped, fluid-filled, fluctuant lesions, approximately 5 mm in diameter, on the maxillary right and mandibular left posterior alveolar ridges (Figures 1 and 2). Following consultations with the Oral Pathology and Oral Surgery services, a differential diagnosis of neonatal lymphangioma, hemangioma, dental laminal cyst, and Bohn's nodules was established. Furthermore, it was decided to do a biopsy on the upper right posterior lesion and to monitor the lower left posterior lesion.

At 7.5 weeks, both lesions were still present, and an excisional biopsy was performed on the upper right posterior lesion under local anesthesia. Aspiration was accomplished before excision, obtaining approximately 1 ml of clear aspirate. The tissue sample and aspirate were sent to the Oral Pathology service for histological examination and a possible diagnostic test on the aspirate.

The patient was observed periodically over a period of six months. At one-week postoperatively, the upper right biopsy site was healing without sequela. At 17.5 weeks of age, the lower left posterior lesion began to regress spontaneously. By six months of age, all intraoral morbidity had resolved. The patient is being observed at six-month intervals with no recurrence noted.

HISTOLOGICAL REPORT

Histologically, the exophytic lesion was covered by a thin layer of hyperparakeratotic stratified squamous epithelium. Beneath this was noted numerous thin-walled dilated vessels, which were interpreted as being lymphangiomatous in nature, surrounded by a loose network of collagen and numerous vascular channels (Figures 3 and 4).

SUMMARY

Two alveolar ridge lymphangiomas in a black neonate were identified. No case of neonatal lymphangioma in a non-black has been reported. The majority of treatments for lymphangiomas have been either surgical removal or allowing for spontaneous regression. Both treatments were tried in this case with equal success. The treatment of choice may be to allow for spontaneous regression with periodic monitoring, if the lesion is not endangering the child, thus avoiding surgery.

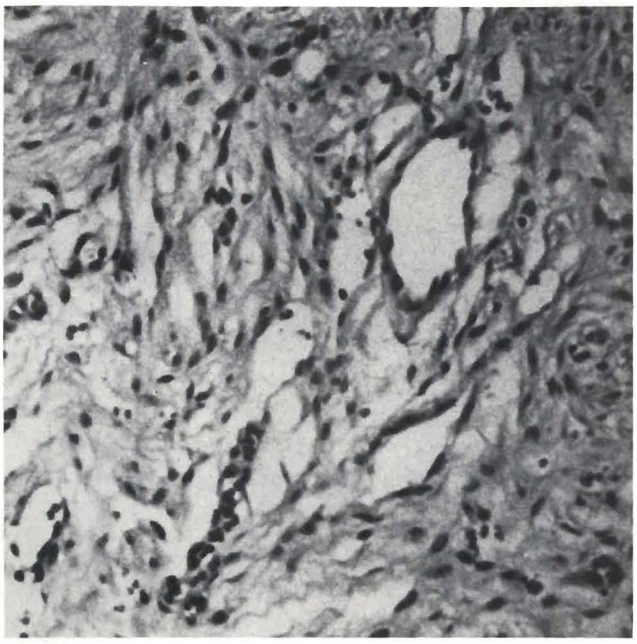

Figure 4. Histological section shown in medium power.

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FROM DIRTY TO DRINKABLE

Supplying modern communities with water is often a staggering task. The average American family uses about 600 gallons (2,271 l) a day — most of it recycled and all of it pure enough to drink. Few people are aware of the many processes that water must undergo before it reaches the tap. Raw sewage, dissolved pollutants and silt must be removed and bacteria destroyed. At every step of its journey water must meet increasingly strict standards of cleanliness.

The purification of drinking water is an ancient practice — a Sanskrit record dating from 2000 B.C. advises treating water by "boiling it and dipping a piece of hot copper into it seven times." Engineers now routinely add chlorine to kill bacteria and alum to precipitate out silt and other impurities. But new problems keep pace with advances in purification technology. Nondegradable chemicals seep into the water from industrial and agricultural wastes, building up potentially dangerous concentrations. Faced with the need to stop such pollution at its sources, no supply system can ever be complacent about the quality of its water.

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Lymphangioma of the tongue: report of case

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Lymphangioma is a relatively rare occurrence, characterized by proliferation of the lymphatic vessels, and as the counterpart of the hemangioma of blood vessels. The common sites at which lymphangiomas are found include the neck and axilla, where 95 percent of these lesions occur.[1] The remaining 5 percent are scattered among various sites including the mediastinum, mesentery, internal viscera and bones.[2] The lymphangioma may cause skeletal overgrowth and distortion, especially in the head and neck region. Lymphangioma involves the tongue more frequently than any other intraoral site, but is also seen in the lips (macrocheilia), buccal mucosa, gingiva and palate.[4] The majority of cases of lymphangioma are present at birth and become clinically apparent in 80 to 90 percent of patients, during the first year of life.[6] In a study of forty-two cases by Nix, 71 percent had an onset in patients under fifteen years of age. Hill and Briggs reported 88 percent of 132 patients had developed the lesion by the end of the second year of life. Although lymphangioma may be present in the tongue at an early age, it tends to grow slowly and remain quiescent for many years. The lesions are not tender or painful and unlike hemangiomas, do not regress spontaneously. Growth usually ceases at puberty, however, unless infection intervenes.[9] Inflammation from trauma or infection results in excessive lymph tissue formation, causing sudden enlargement and severe pain of the tongue.[10] Lymphangioma is a common cause of macroglossia in children. Extensive lymphangiomic lesions may cause gross deformities of the tongue, which may interfere with speech and swallowing.[3]

Lymphangioma may be classified in three categories:

- ☐ Lymphangioma simplex consisting of small capillary- sized lymphatic channels.
- ☐ Cavernous lymphangioma, consisting of dilated lymphatic vessels, often with fibrous adventitia.
- ☐ Cystic lymphangioma composed of endothelium-lined cysts of various sizes.[11,12]

Lymphangioma may be localized or diffuse, the diffuse form being much more common.[10] The anterior two-thirds of the dorsal surface of the tongue is primarily affected, typically bilaterally. This affect was reported in a series of forty-six cases.[13] The lymphangioma arising in the superficial submucosa of the tongue presents as a sessile papillary nodule and is usually bluish in color. If the lymphangioma is covered with a thicker-than-usual layer of mucosa, the bluish color will be masked and it will present as a pink, smooth or nodular, dome-shaped lesion. A lymphangioma of this type is located in deeper tissues of the submucosa.[3] In some cases, relatively large areas of tissue may be involved. The irregularity of the surface of the tongue, with gray and pink projections, is the most common sign of the disease and when associated with macroglossia, is pathognomonic of lymphangioma. Macrocheilia and macroglossia may result from the capillary form of lymphangioma. Small, single lymphangiomas that occur as pale white or pink,

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soft fluctuant lesions of the tongue, are of the cavernous type and are by far the most common.[9] The nodular sessile forms of lymphangioma may make clinical diagnosis difficult and should be differentiated from such lesions as the papilloma, pyogenic granuloma, fibroma, myoblastoma, rhabdomyoma, neurilemoma and hemangioma. The color of the hemangioma is usually dark red to blue, depending upon the number and size of blood vessels present. Digital pressure on the surface of the hemangioma will usually cause blanching; the release of pressure allows the return of blood and color. The pressure method can be helpful in distinguishing the hemangioma from the lymphangioma.[3]

TREATMENT

Treatment depends upon the location and persistence of the lymphangioma. Small lesions, such as those occurring on the dorsum of the tongue, are often continually irritated and may cause the patient discomfort. Lymphangiomas do not undergo malignant change, but spontaneous regression of the lesion is also unlikely.[3,14] In a series of thirty-two cases of cystic lymphangioma in children, there were no reports of spontaneous regression.[15] Radiation therapy is not recommended.[16] Lymphangiomas do not respond to sclerosing agents.[17] Sclerosing agents induce regression and the creation of reactive fibrosis, which makes subsequent surgical excision more difficult.[18] Local recurrence of the lymphangioma has been documented. Delay in treatment may result in continued growth of the lesion, creating secondary complications and increase the extent and risks of surgical excision. Thus, surgical excision is the preferred treatment after a thorough clinical examination and history of the lesion have been secured.

REPORT OF CASE

A three-year-old white male came to the Dental Clinic for an initial examination, oral diagnosis, treatment plan, prophylaxis, and fluoride treatment. During the oral examination, an exophytic lesion on the dorsal side of the patient's tongue was noticed (Figure 1). There were no other significant findings of the oral soft tissue, dentition or of the head and neck region. The patient's medical and family history were noncontributory. Clinical evaluation of the lesion determined a well- circumscribed lesion in the midline of the tongue just anterior to the foramen cecum. The mass was 0.8 cm in diameter and was elevated 0.4 cm above the tongue's surface. The surface was slightly nodular and dilated with punctate vascular markings. The color was slightly more pink than the rest of the tongue. The consistency of the lesion was soft and it did not blanch with pressure. The patient and the parents were unaware of the lesion. The father thought it may have been present ever since the patient was born, but was unsure. The patient did not feel any discomfort and did not complain of the lesion. The patient was seen again in four weeks for reevaluation of the lesion. Upon reexamination, no changes were observed in the lesion except for the color. The surface of the mass was not brownish in color and the vascular markings had regressed (Figure 2). A clinical diagnosis of pyogenic granuloma was made. The patient was referred to an otorhinolaryngologist for evaluation and possible biopsy.

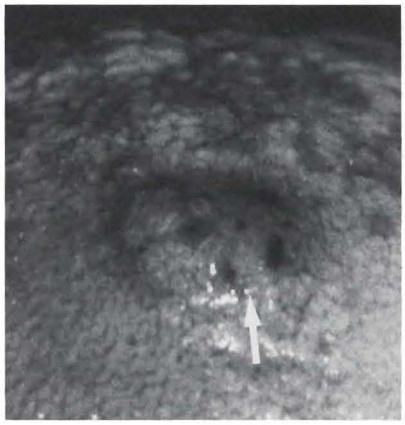

Figure 1. Initial presentation of well circumscribed, sessile, nodular lesion of the tongue, dilated with punctate vascular markings.

Figure 2. Four week reevaluation of the exophytic mass of the tongue disclosed regression of vascular markings.

The patient was admitted for excision of the lesion. Results of the admission, history, physical examination, and laboratory data were within normal limits. Under

Figure 3. Histologic examination of the tissue samples show stratified squamous epithelium irregularly acanthotic and bluntly papillomatous. Ectasia of superficial stromal blood vessels and dilated lymphatics lined by endothelial cells are apparent.

general nasotracheal anesthesia, the lesion was totally excised. The excised tissues consisted of a portion of soft tissue, including underlying muscular tissue and tunica mucosa. Sections of histological examination of the excised tissue showed an oval mass of nonkeratinizing stratified squamous mucosa, in which there was present underlying skeletal musculature. The epithelium was maturing normally, and was irregularly acanthotic and bluntly papillomatous. There were irregular prominences and ectasia of superficial stromal blood vessels and dilated lymphatics lined by endothelial cells (Figure 3). An increase in chronic inflammatory cells was noted within the superficial stroma. A diagnosis of lymphangioma was made.

DISCUSSION

The most common intraoral site for lymphangioma is the tongue. When clinical evaluation and thorough history fail to give a definitive diagnosis, a differential diagnosis must be made before treatment is begun. This case demonstrates a clinical misdiagnosis based on the clinical evaluation of this lesion. Other diagnoses considered include: papilloma, pyogenic granuloma, fibroma, myoblastoma, rhabdomyoma, neurilemoma and hemangioma. Diagnosis may be established according to the case history, presenting systems, and clinical examination. Surgical excision followed by histopathological diagnosis is definitive.

SUMMARY

Lymphangiomas are benign tumors of the lymphatic vessels, usually found in children. Lymphangiomas, however, may be misdiagnosed and in the absence of treatment may increase in size, producing macroglossia, swallowing and speech interferences, and respiratory difficulty. The size and isolated location of the lesion in the midline of the tongue reported here are unusual; few similar cases have been reported in the literature. Complete surgical excision provided not only removal of the lesion, but allowed normal recontouring of the tongue.

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Talon cusp affecting the primary maxillary central incisors: report of case

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The talon cusp is a dental anomaly, composed of normal enamel and dentin, which projects from the cingulum area of a maxillary or mandibular anterior tooth. The shape of the cusp resembles an eagle's talon, and the cusp length may vary, sometimes extending beyond the incisal edge of the tooth.[1] A deep developmental groove may be present where the cusp joins the sloping lingual surface of the tooth. Radiographic examination may reveal the presence and location of the pulp tissue in relation to the outer enamel layer.

Shafer *et al* reported that the talon cusp is uncommon and occurs in maxillary and mandibular permanent incisors.[2] Mellor and Ripa reported seven cases of talon cusp involving one mandibular and eight maxillary incisors. They stated that the talon cusp is an unusual and relatively rare anomaly occurring in permanent incisors of either arch.[1]

A review of the literature of the past fifteen years revealed twenty-three reported cases of talon cusp involving thirty-eight anterior teeth. Ninety percent of the talon cusps occurred in anterior permanent teeth, and 91 percent of the affected teeth were in the maxilla.[1,3-12]

Henderson first reported a case of talon cusp in a primary tooth in 1977. The affected tooth was a left maxillary central incisor with deep lingual grooves on either side of the talon cusp. The permanent successor in this patient did not exhibit the anomaly.[4] Another case of talon cusp in the primary dentition was reported by Mass *et al*. A single maxillary central incisor was affected. In this case, however, the cusp was composed of regular smooth enamel with no fissures or invaginations on its surface.[5] Davis *et al*, presented a case of maxillary central incisors with exaggerated cingula.[8]

The present report describes a case of talon cusp affecting both primary maxillary central incisors.

CLINICAL REPORT

The patient, a one-year-old Hispanic male, first presented to the Dental Department at Children's Medical Center in Dallas, Texas, on March 4, 1986. The mother expressed concern about the abnormal shape of the upper central incisors.

The patient's medical history was unremarkable. Examination of the oral cavity revealed normal soft tissues and normal development of the primary dentition. Both maxillary central incisors exhibited a well-defined lingual cusp (Figure 1). A shallow developmental groove was present on either side of the talon cusp in both teeth. None of the developmental grooves, however, were carious. Radiographic examination revealed that both cusps were composed of normal enamel and dentin and contained a horn of pulp tissue (Figure 2). The other structures of the affected teeth showed normal development. The patient's overbite and overjet were both approximately 4 mm, and the talon cusps did not, at that time, interfere with the occlusion. All other incisors were normal in shape and size. The mother had no knowledge of a similar anomaly in either of the dentitions of other family members.

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Table ☐ Tabulation of cases of talon cusp in the primary dentition.

Patient				Tooth		
Author	Age	Sex	Medical history	Location	Clinical Appearance	Treatment
Henderson	4	F	Unremarkable	Maxillary primary central incisor	Deep developmental grooves with extensive caries and discoloration	Pulpectomy
Moss, Kaffe, Buckner	1	M	Unremarkable	Maxillary primary central incisor	No developmental grooves, noncarious	None
Morin	1	M	Unremarkable	Maxillary primary central incisors	Shallow developmental grooves, noncarious	Pit and fissure sealants

Pit and fissure sealants (Prisma Shield*) were placed in the developmental grooves of both cusps. The teeth will be evaluated periodically to assess for caries and occlusal interferences, and the development of the permanent successors will be monitored.

DISCUSSION

Talon cusp is a dental anomaly that occurs in both the primary and permanent dentitions.[4] Only 10 percent of the reported cases, however, occurred in primary teeth (Table).[1,3-12]

Different physiological growth processes, which overlap considerably, participate in the progressive development of a tooth. The regular changes in the size and proportions of a growing tooth germ are caused by proliferative growth. Following histodifferentiation, the tooth undergoes morphodifferentiation during which the basic form and relative size are established. Disturbances during morphodifferentiation, such as altered endocrine function, may affect the shape and size of a tooth without impairing the function of the ameloblasts or odontoblasts. Additional cusps may be differentiated with enamel and dentin that are normal in structure.[13]

A diagnosis of talon cusp in the primary dentition is not usually made before tooth eruption. The radiographic examination is particulary important, therefore, in defining the internal anatomy of the cusp rather than in making a differential diagnosis.[1]

The clinical management of a talon cusp in the primary dentition presents many of the same problems as in the permanent dentition. The caries susceptibility of the developmental grooves must be assessed and the appropriate therapy provided. Henderson recommended prophylactic sealing of the deep lingual grooves as a temporary measure.[4] Simonsen reported a sealant retention rate in primary teeth of 99 percent at twelve months, while Gourley found that 93 percent of the primary teeth in his study had an intact occlusal sealant after two years.[14,15] Other investigators reported on the effect of occlusal forces on sealant effectiveness.[16,17] Given that the normal life expectancy of an anterior primary tooth is between five years and six and a half years, and that the clinical effectiveness of sealants beyond two years in primary teeth hasn't been established, periodic evaluation of pit and fissure sealants placed in the developmental grooves of a talon cusp is recommended.

The occlusion may be altered by the presence of a

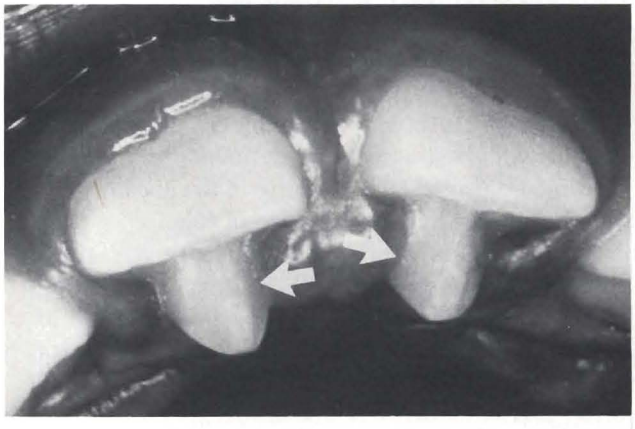

Figure 1. Occlusal view of partially erupted primary maxillary central incisors with talon cusps.

*L.D. Caulk Co., Division of Dentsply International: Milford, DE.

Figure 2. Radiograph showing talon cusps with normal enamel and dentin, and pulp tissue extending into the cusps.

talon cusp, particularly when it occurs in a maxillary tooth.[1,4,7,9,10,12] Reduction of the cusp to eliminate the occlusal interferences, however, does not always result in pulpal exposure and endodontic therapy for the tooth.[7,11,12] The radiographical examination may be helpful in determining the presence or absence of a pulp and its location within the talon cusp. The dynamics of the primary dentition require continued monitoring of the occlusion during the eruption of a talon-cusped tooth.

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FROM WHENCE THE RIVERS COME

Here at this scene, on a scale infinitely smaller than the most diminutive creature, and at this instant, a mighty river was being conceived on the quiet ocean surface through the union of a shaft of midsummer sunlight and particles of a receptive sea.

The story of a river is one of life: the existence of trout and cloud, of seaweed, torrent, dragonfly, raindrop, and starfish—the warp and woof of three billion years.

One thread of the continuum in time and space had begun long ago in the hidden core of the contracting sun; there, during a self-sustaining transmutation of elementary particles, a fusion of hydrogen to helium, powerful forces commenced their tortuous and often delayed journey outward to the face of that incandescent star.

Amos, W.H.: The infinite river, New York: Random House, 1970, p5.

Complex odontoma: report of case

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The odontoma is the most common odontogenic tumor of the head and neck region. It is a slow growing, nonaggressive tumor, comprised of enamel, dentin, cementum, and pulp tissue.[1,2] There are three types of odontomas: complex, compound and ameloblastic.[2,3] The odontoma is most often noticed in the second and third decades of life, during routine radiographic examination.[3,4] This lesion can develop, however, at any age.[5-8] The cause of the odontoma is unknown. Derangement during normal morphodifferentiation, or a defect during the development of the lamina dura have been cited as possible factors.[4,9,10] This tumor is frequently found in association with a developing tooth bud, a supernumerary tooth, or a retained primary tooth.[3,] There have been reports of the tumor occurring in the ramus, however, at the inferior border of the ramus, and in the maxillary sinus.[4,10,11] The incidence of the tumor is reported to be slightly higher in males.[9,12] The complex odontomas, however, occur in a 2:1 ratio, in females.[1,3,4]

The odontoma goes frequently undetected. It is almost always asymptomatic, depending upon its size and location, and has a limited growth potential.[3] The usual presenting symptomatology is an impacted or unerupted tooth, a retained primary tooth, or a swelling.[9,13,14] There is some controversy as to the frequency of location of the odontoma: For example, depending upon the study quoted, the odontoma either occurs with equal frequency in the mandible and maxilla, or is more common in the maxilla.[9,15] There is some evidence, however, to indicate a greater propensity for the compound odontoma to occur in the mandible.[16] This is a case report of a six-year-old boy with a complex odontoma, associated with an unerupted central incisor, a hypoplastic defect of the enamel of the unerupted tooth caused by the proximity of the lesion, and a resulting malocclusion.

REPORT OF CASE

A six-year-old black male presented to the Department of Pediatric Dentistry, Howard University College of Dentistry with a chief compliant of an unerupted tooth, in the premaxillary region. The patient was totally asymptomatic with the exception of a localized, erythematous swelling in the area of the maxillary right central incisor (Figure 1). The patient's medical history was unremarkable and he presented as a normal individual. The dental history included routine restorative treatment and no record of oral trauma. Periapical, occlusal, and panoramic radiographs taken of the area disclosed a radiopaque mass unlike a developing tooth germ (Figures 2,3). Consultation with a histopathologist resulted in a tentative diagnosis of odontoma. It was recommended that the lesion be removed.

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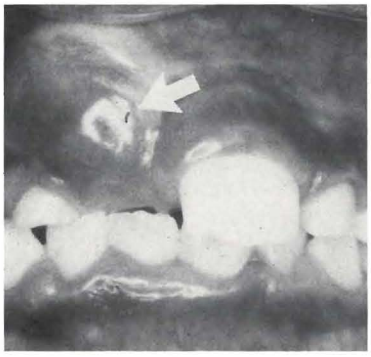

Figure 1. Initial visit of the patient, six-years-old, with swelling in the area of the right central incisor.

The patient was referred to the Oral-Maxillofacial Department for excision of the lesion. The right maxillary primary canine and lateral incisor were removed to provide access. The tumor was excised and submitted for biopsy. Histological examination showed the tumor to be a complex odontoma.

The one-week postsurgical checkup showed minimal edema and generous quantities of granulation tissue, at the surgical site.

DISCUSSION

There have been many reported cases of odontomas occurring with symptomatology of an unerupted tooth or swelling. The radiographic evidence of the development of the odontoma has been documented in the literature.[17] The case reported here is significant, because it points to the importance of early detection and treatment. As a result of the proximity of the lesion to the developing central incisor, an enamel defect occurred (Figure 4). Earlier reports in the literature described displacement of the tooth germ, as a result of an odontoma.[18] In this case, the maxillary permanent right lateral incisor was missing and there was no familial history of congenitally missing teeth. The stabilization of the dentition was essential. It was planned to treat the patient for all his dental needs, but once the tumor was removed, the patient was unavailable for consistent and comprehensive postoperative treatment.

CONCLUSIONS

Early detection and histological examination were important. Expedient removal of the lesion provided an unobstructed path for the eruption of the central incisor.

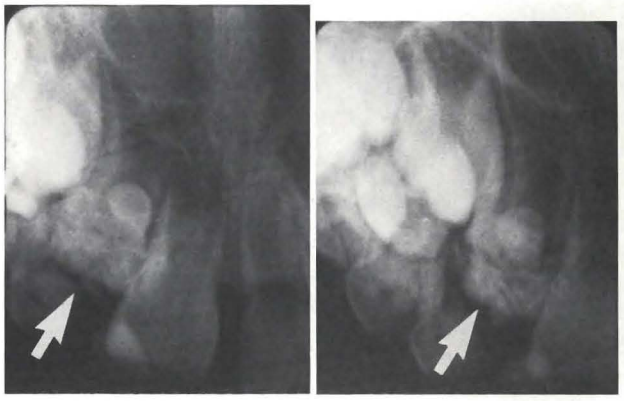

Figure 2, L and R. Periapical radiographs show radiopaque mass in the area of the central incisor.

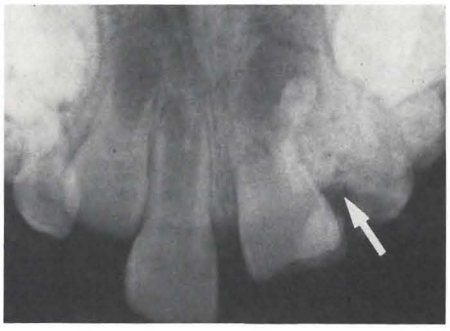

Figure 3. Occlusal radiograph with odontoma. The central incisor is unerupted and slightly displaced.

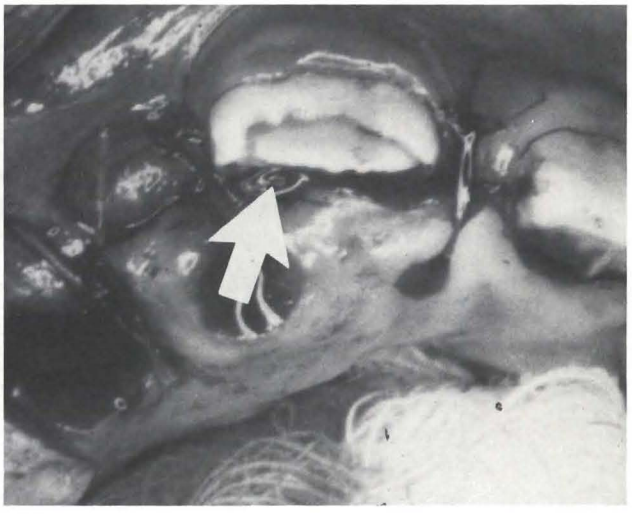

Figure 4. The maxillary right central incisor with an enamel defect as a result of the proximity of the odontoma to the developing tooth.

A disturbance in the development of the tooth bud proximal to the lesion caused an enamel defect. Long-term follow-up would have proved to be the most appropriate treatment to help the patient achieve optimal dental health.

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THE COMPLEXITY OF MAN

Always there had been this drive toward complexity, this restless evolutionary striving of life to fit the environment. When a good fit was achieved, life endured and flourished; when the environment changed due to natural causes, life kept pace if it could, but if some forms disappeared, there never failed to be a pressure and replacement of life forms from the world's vast reservoirs. Life, the apex of creation, was persistent and filled every possible environmental niche; for over two billion years there had been few voids in the biosphere, that thin and fragile shell of life embracing the planet. Life, whose intrinsic form always reflects its function, was the continual recycling of earthly matter driven by the power of the sun.

Now the capriciousness of man altered the scheme and introduced a spreading degradation of nature. His creativity was nothing of the sort, but an interference and a destruction, bit by bit, of all that the world had built. His interruption and despoiling of the river's cyclical events and of life in water only meant harm to himself and to the world supporting him. Man drew nearer his own extinction on this small, isolated planet, pulling down with him many of the creatures that had sustained him during his short reign.

Yet man possesses the ultimate complexity denied all other life: he is the world—its physical and energetic components—at last aware of itself. His intellect is capable of perceiving the change and blight he has brought to the earth, as it is capable of halting and restoring some of the loss. He is aware there are too many of his kind; that by his very numbers he burdens the sky, earth, and its waters. As a conscious manifestation of the world's evolutionary progress, he is bound to the creation of new levels of complexity for survival. He still does not realize his fit in the world. If fear is a catalyst, he might reflect that in the history of life, being a misfit leads to extinction.

Amos, W.H.: The infinite river. New York: Random House, 1970. p267.

Cherubism: report of three cases

Jagu R. Patel, BDS, MS

Cherubism is a very rare, inherited autosomal-dominant disease, affecting mostly the mandible. The disease entity was first described by Jones in 1933.[1] Most patients with cherubism show bilateral facial swelling especially in the angles of the mandible. In rare cases, the condition involves the maxilla.[2] The appearance of cherubism occurs around the age of two years and is usually recognized about the age of seven years.[3] Cherubism is referred to by different authors as Familial Fibrous Dysplasia, Familial Multilocular Cystic Disease of the Jaws and Hereditary Fibrous Dysplasia of the Jaws.[4]

Genesis of this disease has been well described by Anderson and McClendon.[5] The gene penetrance is almost 100 percent in males and approximately 50-70 percent in females. Clinically, the patient presents with a chief complaint of painless bilateral swelling involving the angles of the mandible. On palpation, the lesions are hard and the jaw is expanded. Frequently, lymphadenopathy is reported.[4] There is often displacement of erupted teeth. The oral mucosa is usually intact and normal in texture and color.

Cherubism presents a radiographic picture of classical bilateral multilocular cystlike lesions involving the ramus and body of the mandible. Some radiologists classify this image as a soap-bubble appearance. The borders of the cystlike lesion tend to blend with normal bone as the lesion enlarges and the appearance is very similar on both sides of the mandible. There is also expansion of both the buccal and lingual cortical plates, which is obvious on clinical examination. Erupted teeth are often displaced and partial anodontia frequently occurs. In some cases, there are missing teeth, most commonly the second and third molars. The disease is rarely seen in the midline of the mandible or in the maxilla.

Laboratory findings in cherubism are usually within normal limits. The histological picture shows the presence of large multinucleated giant cells in a loose connective tissue stroma, and the disease cannot be distinguished from central giant cell granuloma on a histological basis.[4]

The cases presented here are of interest because of the ages of the patients at the time of initial diagnosis, the different appearances of the lesion, and the involvement of three family members.

Report of cases

The patients are three white sisters, ages eight, twelve, and twenty years; all have the same parents. The mother of these patients brought the twelve-year-old girl for a dental checkup with a chief complaint of "teeth growing crooked". The mother had also noticed swelling of the mandible at the angles, for the past two years. About a year ago, the patient went to a dentist for the extraction of primary teeth; at that time the dentist did a biopsy of the swollen area, which, according to the patient's mother, was negative.

On clinical examination, there were normal facial fea-

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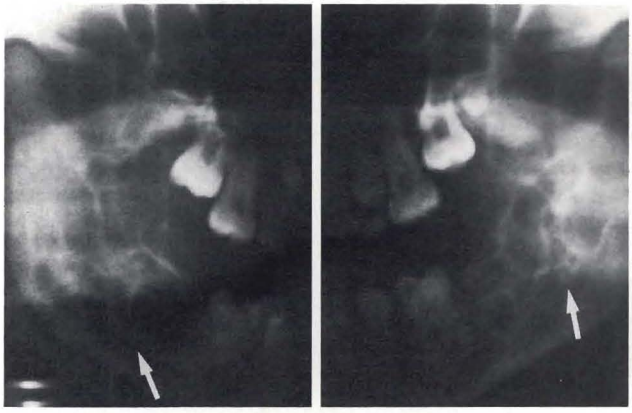

Figure 1. Panoramic radiograph of the twelve-year-old patient, demonstrating bilateral multilocular cystic lesions in the mandible and partial anodontia characteristic of cherubism.

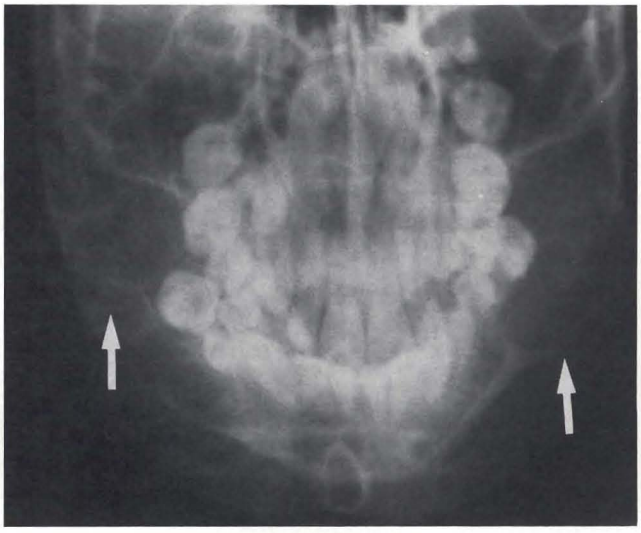

Figure 2. Posterior-anterior mandibular radiograph of the twelve-year-old patient, demonstrating bilateral expansion and thinning of the cortical plates.

tures except for the swelling at the angles of the mandible. On palpation of the mandible, hard "knots" were felt from the angles of the mandible to the mental foramina. The maxilla was of normal size and shape with normal alignment of the maxillary teeth. The mandibular teeth were malposed.

The mother was questioned about the possibility of similar conditions existing in other family members. A younger sister, eight-years-old, had a similar condition; but a twenty-year-old sister did not have any of the signs, other than a slight fullness at the angles of the mandible.

Panoramic and posterior-anterior (PA) radiographic views of the mandible were prescribed on all three girls. The radiographs of the eight-year-old and twelve-year-old girls showed similar findings. Both cases showed bilateral multilocular radiolucencies in the mandibular molar areas, extending into the rami. In both sides of the mandible, the size and growth patterns of the lesions were fairly symmetrical. Expansion of the buccal and lingual cortical plates was obvious on clinical examination and was also seen in the posterior-anterior mandibular radiograph. The panoramic radiograph showed partial anodontia. Both radiographs showed thinning of the cortical plates. Figures 1 and 2 show the panoramic and posterior-anterior mandibular radiographs of the twelve-year-old girl.

The radiographs of the twenty-year-old sister showed a different picture. There were 3 cm by 2 cm radiolucencies with few septa, in the rami of the mandible. This finding is consistent with a regressive picture of the disease.

To investigate further the family trait of the disease, a panoramic radiographic examination of the mother was prescribed. The radiograph showed a mandible and a maxilla of normal appearance. A radiographic examination of the father was not available.

DISCUSSION

Cherubism is a rare disease involving the mandible bilaterally and in some cases the maxilla. In the differential diagnosis of cherubism one should include fibrous dysplasia, giant cell granuloma, aneurysmal bone cyst and nevoid basal cell carcinoma syndrome. All of these diseases, however, occur unilaterally.

Most patients with cherubism are diagnosed when they are much younger than in the cases reported in this paper. The diagnosis of this disease requires clinical and radiographic examinations. These three patients showed the typical radiographic appearance of cherubism. Most authors believe that the lesion is resolved at puberty and the radiographic finding in the twenty-year-old girl is consistent with this observation. No specific treatment was recommended for the two younger children, but they are kept under observation.

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headed families, it was 72.1 percent.

It is important to identify why the proportion of out-of-wedlock teen births is rising, and the author does this very effectively in this chapter. The cause among black teenagers is a drop in marriage rates, not an increase in birth rates. Among white teens, the cause is more babies coupled with a decrease in marriage among those who become pregnant.

Also in Chapter 1, Edelman discusses such topics as "Scholarly Perspectives on the Black Family," "Where are the Black Fathers?", and "What is Being Done by the Black Community?". The author recalls Dr. King's caution of twenty years ago, "For God's sake and our children's future, let us seize the opportunities and avoid the dangers that we know are lurking. Let us focus on what unites us, on the overwhelming majority of poverty that we can do something about now, and on preventing another generation of black babies from becoming the poor black mothers and fathers that we so begrudgingly try to help today through our social policies."

In Chapter 2, the author discusses white poverty and suggests a range of preventive investment strategies in health, nutrition, and child care to address the immediate survival needs of poor black and white children.

In Chapter 3, Edelman calls for a comprehensive campaign to prevent teen pregnancy and to ensure that all teen mothers receive comprehensive prenatal care, and stay in school.

In Chapter 4, we read the welfare-reform strategies as one element in a larger self-sufficiency effort to prevent the poverty of female-headed households and the development of a permanent underclass.

In the final Chapter, Ms. Edelman discusses the importance of more effective leadership by all elements of American society. The joint efforts of black and white community leaders, the private sector, and all levels of government are required. A closing statement tells us that "Every individual has a responsibility to try to make a difference, to give imaginative flesh to the ideal of justice. We should aim high."

Preventing pit and fissure caries: a guide to sealant use. Louis W. Ripa, chairman, Sealant Task Force, *et al.*
Published by Massachusetts Department of Public Health. Division of Dental Health, 1986; 50 pages; $6.50.

This guide was prepared by a task force consisting of Louis W. Ripa, chairman; Harry M. Bohannan, University of North Carolina; Virginia A. Callanen, Massachusetts Department of Health; Gregory N. Connolly, Massachusetts Department of Health; Judith A. Disney, University of North Carolina; James R. Hardison, Tennessee Department of Health and Environment; Alice M. Horowitz, National Institute of Dental Research; Richard J. Simonsen, University of Tennessee.

It is intended for clinicians who use or contemplate using sealants for caries prevention; and for public health professionals who are responsible for planning community programs in preventive dentistry.

The subject is presented in four sections: Section I, The use of sealants; Section II, Technic of sealant application; Section III, Sealant use in individual office programs; Section IV, Sealant use in community programs. Section I presents an overview of sealants, the rationale for sealant therapy, the several market brands of sealants available, and histological and microbiological considerations associated with their use.

Section II presents the technique for applying sealants successfully and with the greatest degree of efficiency.

Sections III and IV are designed to be helpful in understanding all aspects of the problems of using sealants in individuals (Section III) and in community programs (Section IV) such as diagnosis, indications and contraindications, patient education, choice of sealant, use of dental auxiliary personnel, promotion, and records.

You will find this publication a useful one in understanding and using sealants.

ABSTRACTS

Lu, K.H. and others: A three year clinical comparison of a sodium monoflurophosphate dentifrice with sodium fluoride dentifrices on dental caries in children. J Dent Child, 54:241-244, July-August, 1987.
A double-blind caries clinical trial was conducted in an area where the water supply was less than 0.3 ppm fluoride. In comparable groups, the children (7- to 15- year-olds, 4500 total) used ad libitum dentifrices containing either SMFP (F = 2800 ppm); NaF (2800 ppm); or a positive control of 1100 ppm F (Advanced Formula Crest). Higher levels of sodium monoflurophosphate in a dentifrice offer no advantage in caries protection over the 1100 ppm F, the conventional level.

Fluoride, sodium; Fluoride, monoflurophosphate

Rubenstein, Loretta K. and Avent, Mitchell, A.: Frequency of undesirable side-effects following professionally applied topical fluoride. J Dent Child, 54:245-247, July-August, 1987.
A substantial amount of fluoride may be retained in the mouth, using various tray systems with APF gels, and the amounts ingested may vary widely. Signs and symptoms of F toxicity appear within thirty minutes after ingestion and may last for twenty-four hours. Careful adherence to the established

protocol and frequent reminders for the patient to use suction should result in a minimum of undesirable side-effects following topical F treatment, even lower than the 6.6 percent reporting side-effects in this study.

Fluoride; Toxicity; Side-effects

Waldman, H.B.: Increasing use of dental services by very young children. J Dent Child, 54:248-250, July-August, 1987.

The National Health Interview Survey states that between 1973 and 1982, there was a marked increase in dental care occurring in both black and white children younger than age 5. There were considerable differences in the visit pattern, however, by different population groups.

Pediatric dentistry; Dental practitioners; Demographics

Cleaton-Jones, Peter and others: The relationship between the intake frequency and the total consumption of sucrose among four South African Ethnic groups. J Dent Child, 54:251-254, July-August, 1987.

The relationship between sucrose intake frequency and total daily sucrose intake for 576 rural-black; 1,529 urban-black; 857 urban-Indian; and 1,509 urban-white children 2- 5 years old was investigated. A strong linear relationship between sucrose intake frequency and amount was found. This association varied significantly between the four ethnic groups, but did not vary significantly with age. Black children both rural and urban, had the lowest sucrose frequencies for low total daily sucrose intakes, but their response to an increase in total sucrose intake was far stronger than those of the Indian and white children. White children – and to a lesser degree, Indian children – had a lower response to an increase in total sucrose intake. The data suggest that the intake of five sugar exposures per day is "safe" for the teeth.

Sucrose; Dentition; Demographics

Strodel, Betty J.: The effects of spastic cerebral palsy on occlusion. J Dent Child, 54:255-260, July-August, 1987.

This study compared the dental casts and lateral cephalometric radiographs of thirty children with spastic cerebral palsy, with those of a control group. Spasticity is characterized by the pathologic stretch reflex, and also involves clonus; spastic children with cerebral palsy have a greater tendency toward a Class II dental formation with skeletal involvement.

Malocclusion; Pediatric population; Cerebral palsy; Spasticity

Walsh, John S.; Fey, Michael R.; Omnell, Lena M.: The effects of indomethacin on resorption and ankylosis in replanted teeth. J Dent Child, 54:261-266, July-August, 1987.

The purpose of this study was to investigate the effects of indomethacin on the resorption and ankylosis produced by delayed replantation of teeth in dogs. A high dose of indomethacin (5 mg/kg) reduced the amount of external root resorption but was associated with a surprising increase in ankylosis. A lower dose of indomethacin (1 mg/kg) resulted in more replacement resorption.

Tooth replantation; Resorption; Ankylosis; Bone remodelling; Anti-prostaglandin drugs

Pilo, Raphael; Kaffe, Israel; Amir, Erika; Sarnat, Haim: Diagnosis of developmental dental anomalies using panoramic radiographs. J Dent Child, 54:267-272, July- August, 1987.

Panoramic radiographs of 702 children (ages 5 to 12) were examined for developmental dental anomalies. The prevalence of hypodontia found in this survey was relatively high – 8.0 percent. No significant differences were found between males and females in prevalence, or in the number of missing teeth per person. The teeth absent most often were equally the mandibular second premolar and the lateral maxillary incisor. Bilateral hypodontia was found in 51.3 percent of the children with hypodontia. All supernumerary teeth diagnosed (1.28 percent) were in the premaxilla. All of the teeth displaying microdontia were peg-shaped laterals. Rotation was found in 28 percent of the patients. Panoramic radiographs were not suitable to diagnose conditions accurately, such as dens invaginatus, taurodontism and anomalies of position; they should be used when the child is at least 8 or 9 years old, especially for anomalies of number.

Dental anomalies; Pedodontic patients; Panoramic radiographs

Kittle, Paul E. and Weaver, Robert M.: Lymphangiomas of the alveolar ridge in a neonate: report of case. J Dent Child, 54:277-279, July-August, 1987.

This paper presents the diagnosis and treatment of two intraoral lesions in a thirteen-day-old child, a black male with two 5 mm lesions on the alveolar ridge. Spontaneous regression, with periodic monitoring, might avoid surgery.

Lymphangioma; Alveolar ridge

White, Melissa A.: Lymphangioma of the tongue: report of case. J Dent Child, 54:280-282, July-August, 1987.

Lymphangioma is a relatively rare proliferation of the lymphatic vessels; it involves the tongue more frequently than any other intraoral site. Tongue involvement may be localized or diffuse, and is a common cause of macroglossia in children. Clinical presentation alone may make diagnosis difficult and should be accompanied by histopathologic examination. This case report describes a three-year-old boy with a lymphangioma of the tongue and the differential diagnosis and case management to be considered.

Lymphangioma; Tongue; Surgical excision

Morin, Charles K.: Talon cusp affecting the primary maxillary central incisors: report of case. J Dent Child, 54:283-285, July-August, 1987.
This report describes talon cusps in both primary maxillary central incisors. A review of cases reported in the recent literature is presented, indicating that talon cusp occurs most often in permanent maxillary incisors, and in the primary dentition, talon cusp has been reported only in maxillary central incisors. The talon cusp in the primary dentition is clinically significant with respect to caries susceptibility and occlusion, both of which may affect tooth vitality. Appropriate diagnosis and treatment, and the long-term management, are discussed.

Talon cusp; Primary dentition

Thwaites, Melanie S. and Camacho, Joseph L.: Complex odontoma: report of case. J Dent Child, 54:286-288, July-August, 1987.
Odontomas, common in the head-and-neck region, can occur at any age, but are most often found during routine radiographic examination, during the second and third decades of life. A disturbance during tooth development is a possible factor but the specific cause of this tumor is unknown. In this case report, a six-year-old boy had the symptoms of an unerupted tooth. Radiographic examination of the patient showed a radiopaque mass in the anterior maxillary region of the mouth. Biopsy and histological examination confirmed the diagnosis of odontoma. Due to the location of the lesion, an enamel defect occurred in the maxillary central incisor together with tooth displacement. Long-term treatment was needed to correct the esthetics of the central incisor and to stabilize the dentition with minor tooth movement and appliance therapy.

Odontoma, complex; Oral surgery

Patel, Jagu R.: Cherubism: report of three cases. J Dent Child, 54:289-290, July-August, 1987.
Cherubism, a very rare autosomal-dominant disease, affects mostly the mandible. Most patients have swelling in the angles of the mandible. Radiographically the disease presents a picture of classical bilateral multilocular cystlike lesions involving the ramus and body of the mandible. The patients reported on in this paper are three white sisters, ages eight, twelve, and twenty years. The lesion usually is resolved at puberty, when the radiolucencies regress.

Cherubism; Mandible; Ramus; Differential diagnosis

News

ASDC SPONSORS SYMPOSIUM ON DENTAL PHOBIAS

The American Society of Dentistry for Children will sponsor a national symposium "The Challenge of Dental Phobias: A perspective for Educators, Researchers and Practitioners" on October 30-31, 1987 at the American Dental Association in Chicago.

The day and a half program will address such issues as the etiology of dental phobias; proposed primary preventive measures and strategies; the impact of dental phobias upon the population and the profession; proposed curriculum guidelines for dental educational institutions; and the establishment of treatment and research centers.

For more information or a registration form, contact Lana Wos at (312) 943-1244.

DENTAL SPENDING TO RISE

The Commerce Department estimates that Americans will spend $32.8 billion for dental care this year.

The report said expenditures for dentists' services increased from $27.1 billion in 1985 to an estimated $29.8 billion last year and will top $30 billion in 1987. The average annual 10 percent increase in dental spending is in line with increases in total health care spending, expected to total $511.9 billion in 1987.

Some reasons cited for the high growth rate of health care spending are a greater number of elderly patients, use of sophisticated equipment and technology, the passing on to patients of high malpractice insurance costs, and expensive treatment for AIDS and other costly diseases.

An average annual 4 percent growth rate is predicted in the dental equipment and supply industry. Federal support of dental research and development is expected to grow, focusing on areas to improve the appearance of teeth.

DISCIPLINE

Representative Stark (D-CA) claims that state medical boards are inconsistent in disciplining physicians. According to him, in 1985, slightly more than 2100 actions were taken: a half of that number for inappropriate prescriptions, 25 percent alcohol and drug abuse. He cited Georgia, Idaho, Mississippi, Oklahoma, and Oregon for high rates of disciplinary action; and Connecticut, Delaware, Nebraska, and Vermont for low rates.