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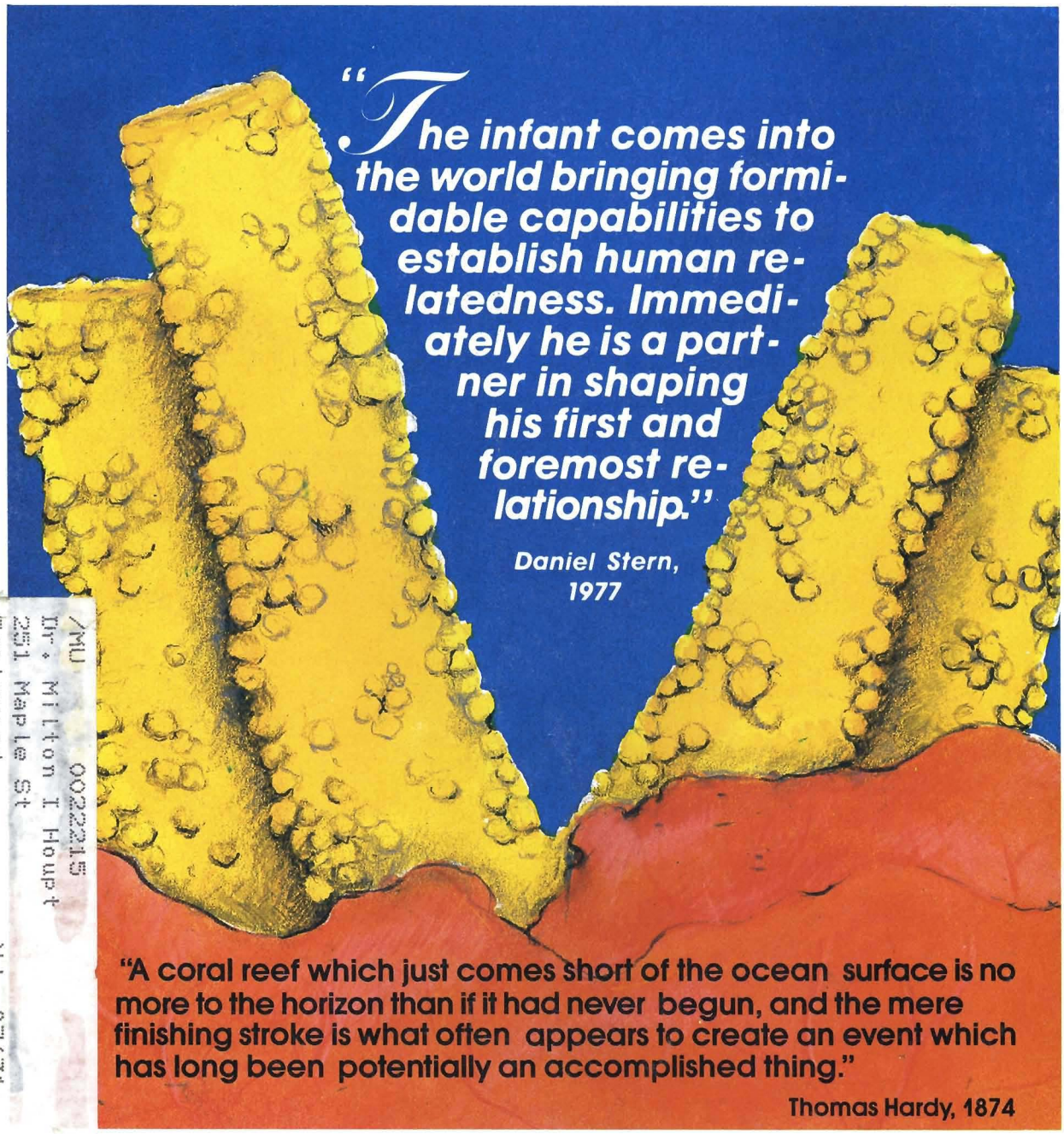
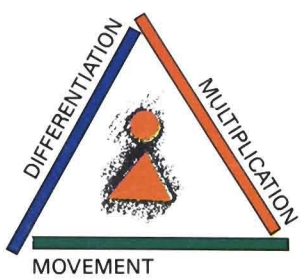


". . . AS EARLY AS THE FIRST DAY OF LIFE, THE HUMAN NEONATE MOVES IN PRECISE AND SUSTAINED SEGMENTS OF MOVEMENTS THAT ARE SYNCHRONOUS WITH THE ARTICULATED STRUCTURE OF ADULT SPEECH."

—William Condon and Louis Sander, 1974



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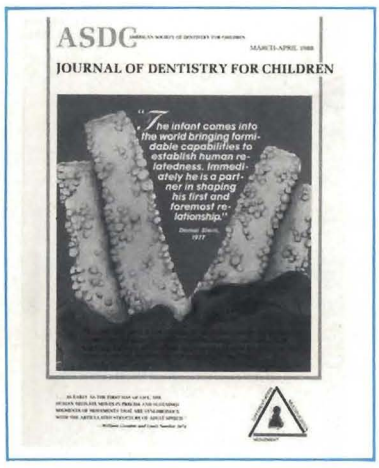

Like Thomas Hardy's coral reef, the ability to think abstractly and reason logically does not occur suddenly and spontaneously. Rather, it is the culmination of a progressive and systematic process of intellectual development that starts in early infancy.

Design and art by Sharlene Nowak-Stellmach.

SURVEY OF ORTHODONTIC SERVICES

INTERCEPTIVE ORTHODONTICS

CLINIC

BEHAVIOR

SUICIDE

CASE REPORTS

For the busy reader

Analysis of orthodontic treatment by pediatric dentists and general practitioners in Indiana—page 97

This investigation analyzed the extent of orthodontic services currently being provided by these two groups of Indiana clinicians. Pediatric dentists were found to provide significantly more comprehensive orthodontic treatment than did the general practitioners. Size of community was significantly related; dentists in towns of less than 25,000 tended to provide more orthodontic services.

Requests for reprints should be directed to Dr. L. D. Koroluk, Dental Clinic Building, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 0W0.

Treatment of unilateral posterior crossbite: comparison of the quad-helix and removable plate—page 102

This study compares the quad-helix and removable plate appliances retrospectively, with regard to efficacy of treatment. The total treatment time, number of visits, and total cost of treatment were also considered in a total of fifty children with unilateral crossbite and laterally forced occlusion.

Requests for reprints should be directed to Dr. R. Ranta, Department of Pedodontics and Orthodontics, University of Helsinki, Mannerheimintie 172, SF-00280 Helsinki, Finland.

Patient's age at initial detection of interproximal caries—page 105

Factors that put patients at risk of dental caries have been suggested for use as criteria in determining the proper time and frequency of bitewing examination for children. All diagnoses of interproximal caries in 100 patients in this study were made from bitewing radiographs.

Requests for reprints should be directed to Dr. Jan E. Kronmiller, Department of Orthodontics, School of Dental Medicine, The University of Connecticut Health Center, Farmington, CT 06032-9984.

Clinical validity of the relationship between TMJ signs and symptoms in children and youth—page 110.

Cross-sectional data on subjective symptoms and clinical signs of TMJ dysfunction were collected from 1,342 subjects ranging in age from 6 to 17 years old. Findings do not support drawing valid clinical conclusions from these studies of the data, due to the sensitivity and false-positive rates.

Requests for reprints should be directed to Dr. M. L. Riolo, Center for Human Growth and Development, 300 N. Ingalls, University of Michigan, Ann Arbor, MI 48109.

Disturbed eruption of the lower second molar: clinical appearance, prevalence, and etiology—page 114

Disturbed eruption of the lower second molar is a rare condition. As its treatment is accompanied by a number of difficulties, particularly in the presence of a third molar, it was decided to study this aberration in a group of patients, evaluating the results of various treatment modes. Modes and results will be discussed in a second paper.

Requests for reprints should be directed to Dr. Mirja Varpio, Pedodontic Clinic, Sociala Huset, 411 17 Göteborg, Sweden.

The retention of fissure sealants using twenty-second etching time: three-year follow-up—page 119

Sealants were evaluated at baseline and after six, twelve, and thirty-six months. Seventy-one teeth with 105 sites were available after three years; total retention rate was 91 percent, with only 9 sealants considered as failures, comparable to the more conventional sixty-second etching time.

Requests for reprints should be directed to Dr. Eliezer Eidelman, Chairman, Department of Pedodontics, Hadassah Faculty of Dental Medicine, Jerusalem, Israel, P.O. Box 12000.

Physical restraint, informed consent and the child patient—page 121

The primary prevention against malpractice is to practice good dentistry; some additional, prevention-oriented steps should be taken, when using physical restraint to modify the behavior of uncooperative child patients, before treating the patient.

Requests for reprints should be directed to Dr. Alan Klein, Grand Blanc, MI 48439.

Death following oral sedation—page 123

This fictional case report describes what happens when the combination of a "heavy dose" of oral sedatives is administered to a two-year-old boy with "extremely poor behavior" during the examination, together with inadequate monitoring of the patient and inappropriate management of the emergency situation: the tragic death of a young child in a dentist's office.

Requests for reprints should be directed to Dr. Milton Houpt, Professor and Chairman, Department of Pediatric Dentistry, UMDNJ-New Jersey Dental School, 110 Bergen Street, Newark, NJ 07103-2425.

Improving children's oral hygiene through parental involvement—page 125

Previous research provided support for predicting the outcome of this study; it is difficult to predict any longer-term effects than the ones seen in this four-week period.

Requests for reprints should be directed to Dr. Arthur P. Mourino, Department of Pediatric Dentistry, VUC/MCV School of Dentistry, 521 N. 11th Street, Richmond, VA 23298.

Effect of dental drawings and coloring on attitudes of child patients—page 129

Drawings of several anticipated dental procedures are depicted in detail for child patients to color, with dental instruments drawn in an oversize scale. Once the child has colored the drawing, the treatment plan is re-explained and treatment is administered unhurriedly. This study tested this method's efficacy in reducing anxiety and fear in children.

Requests should be directed to Dr. Takaaki Koyazu, Department of Psychology, Keio University, Mita, Minato-ku, Tokyo, Japan 108.

Prevalence of mesiodens in a pediatric Hispanic population—page 137

Mesiodens are supernumerary teeth in the region of the maxillary central incisors, a condition that can lead to disorders of the dentition. In the 3,523 Hispanic children surveyed in this study, seventy-six cases of mesiodens were found.

Requests for reprints should be directed to Dr. Laura Castillo Kaler, 5337 Broad Run Rd., Jefferson, MD 21755.

Continued growth of the dentinal papillae after extraction of neonatal teeth: report of case—page 139

In this paper, an example of the complete growth of the dentinal papillae of the central lower incisors, after extraction of neonatal teeth, is described. The early extraction may be the reason that there was no degeneration. At the age of six years, two normal permanent central incisors erupted.

Requests for reprints should be directed to Dr. W.J.H. Berendsen, Afdeling Kindertandheelkunde, Katholieke Universiteit Nijmegen, Postbus 9101, 6500 HB Nijmegen, The Netherlands.

Analysis of orthodontic treatment by pediatric dentists and general practitioners in Indiana

Lorne D. Koroluk, DMD, MSD, MRCD(C)
James E. Jones, DMD, MS, MSD
David R. Avery, DDS, MSD

A current issue in the delivery of dental care is the provision of orthodontic services by pediatric dentists and general practitioners.

Previous surveys showed the extent to which orthodontic services are provided by pediatric dentists. A survey of the Association of Pedodontic Diplomates found that 99 percent of the members who responded to the survey provided some type of orthodontic treatment, and 33 percent provided comprehensive orthodontic treatment.[1] A 1980 survey of the Southwestern Society of Pedodontists indicated that 94 percent of the respondents were providing orthodontic treatment of a more complex nature than simple space maintenance.[2] Of these respondents, 25 percent reported that they were treating comprehensive orthodontic cases. A 1980 North Carolina study investigating productivity and services performed in thirty-six pediatric dental offices concluded that orthodontic services accounted for only 4 percent of performed procedures, and 8 percent of the total practice time.[3]

Few studies or surveys have investigated the extent of orthodontic treatment performed by general practitioners. A survey by the American Association of Ortho-

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dontists stated that 14 percent of the reported reduction in size of practice was due to competition from general practitioners who were increasing the levels of their orthodontic services.[4] A 1980 survey of Chicago general practitioners found that treatment by general practitioners was limited to minor orthodontic procedures; the more complicated cases and those requiring full banding were not provided by respondents to the survey. In 1981, Dugoni *et al* reported that 55 percent of the orthodontic care provided to patients through prepayment programs in California was provided by dental professionals other than orthodontists.[5]

During the past five years, several factors have continued to influence the delivery of dental care in the United States. The caries rate in children continues to decline.[6,7] In the period from 1960 to 1980, the population of under-eighteen-year-old persons has decreased by 22 percent.[8] While the caries and birth rates continue to decline, the number of pediatric dentists continues to increase, both nationally, and in the state of Indiana.[9,10]

Meskin *et al* concluded that a way in which pediatric dentists could deal with these factors would be to offer more sophisticated services, particularly in the area of comprehensive orthodontics.[11]

The purpose of the present investigation was to determine and analyze the extent of orthodontic treatment provided by pediatric dentists and general practitioners in the state of Indiana. The findings were compared to trends obtained in previous national and regional studies. As the other studies were completed five years previously, the current study sought to determine whether more orthodontic treatment is being provided by pediatric dentists and general practitioners today than five years ago.

METHOD

A two-page questionnaire was modeled after one used by the Association of Pedodontic Diplomates.[1]

The questionnaire was mailed to seventy-one pediatric dentists and 500 general practitioners in private practice in the state of Indiana. None of the pediatric dentists surveyed was dually trained in orthodontics and pediatric dentistry. General practitioners were randomly selected according to the size of community in which they practiced, and the number of years since their graduation from dental school. To maintain an equal distribution throughout the state, dentists were selected from each of the fourteen state dental districts. This was done to ensure that the dentists surveyed would be representative of a cross section of the practicing dentists in Indiana. Information regarding practice location and type was obtained from the American Dental Association Directory.[12]

Statistical analysis of the resulting data utilized the Statistical Package for the Social Sciences (SPSS).[13]

Table 1 ☐ Age distribution.

Age	Percentage of pediatric dentists	Percentage of general practitioners
< 30	4.5 (3)	2.5 (9)
30 - 39	30.3 (20)	52.7 (192)
40 - 49	34.8 (23)	32.7 (119)
50 - 59	21.2 (14)	11.3 (41)
> 59	9.2 (6)	0.8 (3)
	100.6 (66)	100.0 (364)

(Absolute numbers of subjects in parentheses)

Table 2 ☐ Population distribution.

Population	Percentage of pediatric dentists	Percentage of general practitioners
> 100,000	43.9 (29)	38.2 (139)
25 - 100,000	40.9 (27)	19.8 (72)
5 - 25,000	13.7 (9)	30.2 (110)
< 5,000	1.5 (1)	11.8 (43)
	100.0 (66)	100.0 (364)

Table 3 ☐ Continuing education in orthodontics.

	Percentage of pediatric dentists	Percentage of general practitioners
Attendance:		
Had attended	95.5 (63)	58.0 (211)
None attended	4.5 (3)	42.0 (153)
	100.0 (66)	100.0 (364)

Calculated $x^2 = 29.65$ which is significant at 0.01 level for 1 degree of freedom.

Table 4 ☐ Trends in restorative and orthodontic services.

	Percentage of pediatric dentists	Percentage of general practitioners
i) Restorative services*		
Increase	10.6 (7)	22.3 (81)
No Change	25.8 (17)	36.5 (135)
Decrease	63.6 (42)	41.2 (150)
	100.0 (66)	100.0 (364)
ii) Orthodontic services:**		
Increase	74.2 (49)	29.9 (109)
No Change	21.3 (14)	56.6 (206)
Decrease	4.5 (3)	13.5 (49)
	100.0 (66)	100.0 (364)

* Calculated $x^2 = 12.23$ which is significant at 0.01 level for 2 degrees of freedom.
** Calculated $x^2 = 47.18$ which is significant at 0.01 level for 2 degrees of freedom.

This study was done at Indiana University School of Dentistry, Indianapolis, and was a recipient of a 1987 Ralph E. McDonald Research Award presented by the Indiana University Pediatric Dentistry Alumni Association.

Table 5 ☐ Percentage of time spent providing orthodontic services.

Practice time	Percentage of pediatric dentists	Percentage of general practitioners
None	1.5 (1)	24.5 (89)
< 10%	34.8 (23)	61.8 (225)
10 - 25%	30.3 (20)	12.4 (45)
25 - 50%	24.2 (16)	0.8 (3)
> 50%	9.2 (6)	0.5 (2)
	100.0 (66)	100.0 (364)

Calculated $x^2 = 124.23$ which is significant at 0.001 level for 4 degrees of freedom.

Table 6 ☐ Conditions treated and appliances used.

	Percentage of pediatric dentists	Percentage of general practitioners
Space Maintenance	100.0 (66)	84.6 (308)
Space Regaining	87.9 (58)	35.4 (129)
Incisor Alignment	84.8 (56)	40.7 (148)
Serial Extraction	69.7 (46)	45.6 (166)
Skeletal Malocclusions	80.3 (53)	23.1 (84)
Comprehensive Cases	62.1 (41)	17.9 (65)
Hawley Appliance	80.3 (53)	59.6 (217)
2 X 4 Appliance	77.3 (51)	23.4 (85)
Headgear	56.1 (37)	10.2 (37)
Functional Appliances	74.2 (49)	29.1 (106)
Straight Wire Technique	66.7 (44)	23.1 (84)
Edgewise Technique	30.3 (20)	5.8 (21)

*Positive responsives only.

Table 7 ☐ Effect of age on trends in time spent providing restorative procedures.

	Age (percentage of practitioners)*				
	< 30	30 - 39	40 - 49	50 - 59	> 60
Increase	16.7 (2)	30.7 (65)	9.8 (14)	10.9 (6)	11.1 (1)
No change	83.3 (10)	42.4 (89)	28.2 (40)	18.2 (10)	11.1 (1)
Decrease	0.0 (0)	26.9 (57)	62.0 (88)	70.9 (39)	77.8 (7)
	100.0 (12)	100.0 (211)	100.0 (142)	100.0 (55)	100.0 (9)

Calculated $x^2 = 82.15$ which is significant at 0.001 level for 8 degrees of freedom.
*Pediatric dentists and general practitioners combined.

Table 8 ☐ Effect of age on trends in time spent providing orthodontic services.

	Age (percentage of practitioners)*				
	< 30	30 - 39	40 - 49	50 - 59	> 60
Increase	75.0 (9)	41.1 (87)	32.4 (46)	25.5 (14)	22.2 (2)
No change	25.0 (3)	50.9 (108)	54.2 (77)	50.9 (28)	44.4 (4)
Decrease	0.0 (0)	8.0 (17)	13.4 (19)	23.6 (13)	33.4 (3)
	100.0 (12)	100.0 (212)	100.0 (142)	100.0 (55)	100.0 (9)

Calculated $x^2 = 24.9$ which is significant at 0.01 level for 8 degrees of freedom.
*Pediatric dentists and general practitioners combined.

RESULTS

Survey forms were mailed to 500 general practitioners. Of these, 473 were considered valid after correcting for various factors such as incorrect or incomplete addresses and erroneous inclusion of specialists. Of the 473 valid questionnaires, 364 were returned for a response rate of 76.9 percent.

Of the seventy-one survey forms mailed to pediatric dentists, sixty-six were returned for a response rate of 92.9 percent.

The data obtained from the survey were compiled and the results are presented in Tables 1 to 9.

Tables 1 and 2 represent the distribution with respect to age and population for both general practitioners and pediatric dentists.

Table 3 indicates that 95.5 percent of pediatric dentists had attended continuing education courses in orthodontics as compared to 58.0 percent of general practitioners ($x^2 = 29.5$, $p < 0.001$).

Trends seen in the provision of restorative and orthodontic services by the survey group can be found in Table 4. Pediatric dentists saw a significant decrease ($p < 0.01$) in the number of restorative procedures they were providing over the past years as compared to general practitioners. At the same time, pediatric dentists saw a significant increase ($p < 0.001$) in the amount of orthodontic service they were providing as compared to general practitioners.

Table 5 shows that the pediatric dentists spent significantly more time ($p < 0.001$) providing orthodontic services than general practitioners. Approximately 33 percent of the pediatric dentists spent more than 25 percent of their time providing orthodontic services to their patients.

Table 6 lists the conditions treated and the appliances used by general practitioners and pediatric dentists. In all cases, the differences were significant at the 99.9 percent level of confidence.

Tables 7 and 8 show the relationships of the ages of the participants in the survey (pediatric dentists and general practitioners combined) to the times spent providing

Table 9 ☐ Effect of population on the percentage of time spent providing orthodontic services.

Percentage of time	>100,000	25,000 - 100,000	5,000 - 25,000	< 5,000
None	30.9 (52)	21.2 (21)	9.2 (11)	13.6 (6)
<10	50.6 (85)	52.5 (52)	71.4 (85)	59.1 (26)
10 - 25	11.9 (20)	17.2 (17)	14.3 (17)	25.0 (11)
25 - 50	5.4 (9)	8.1 (8)	1.7 (2)	0.0 (0)
>50	1.2 (2)	1.0 (1)	3.4 (4)	2.3 (1)
	100.0 (168)	100.0 (99)	100.0 (119)	100.0 (44)

Calcuated $x^2 = 36.67$ which is significant at 0.01 level for 12 degrees of freedom.
*Pediatric dentists and general practitioners combined.

restorative and orthodontic services. The ages of practitioners were found to affect significantly ($p < 0.001$), the trends seen in the orthodontic and restorative services provided. The younger practitioners tended to report an increase in the amount of orthodontic service performed. The older practitioners tended, on the other hand, to report a decline in the number of restorative procedures performed.

In this survey, the size of the community was significantly related to the percentage of time spent performing orthodontic services ($p < 0.01$) (Table 9). A greater number of dentists in smaller communities (less than 25,000 people) tended to provide more orthodontic services.

The influence of continuing education courses on the total test group was investigated. Both practitioner-age and community-population were shown to be not significant ($p > 0.05$) with respect to continuing education courses in orthodontics.

Continuing education in orthodontics was found to be highly significant ($p < 0.001$) with respect to the type of orthodontic conditions treated and the type of orthodontic appliances and techniques used in practice. Practitioners who had not taken continuing education courses did not provide complex procedures, such as comprehensive full banded cases.

As might be expected, practitioners who had attended continuing education courses spent significantly more time ($p < 0.001$) providing orthodontic treatment than those who had not. Practitioners who had attended continuing education courses saw a significant ($p < 0.001$) increase in the amount of orthodontic treatment they provided as compared to those who had not attended continuing education courses.

DISCUSSION

The response to the survey was within an acceptable range for forming valid conclusions.

The 1981 survey of the Association of Pedodontic Diplomates found that 33 percent of the diplomates provided some comprehensive services.[1] A survey of the Southwestern Society of Pedodontists concluded that only 25 percent of responding members provided comprehensive orthodontic treatment at that time.[2] A North Carolina survey showed that pediatric dentists devoted less than eight percent of their practice time to any type of orthodontic procedure. The current Indiana survey found that 62 percent of responding pediatric dentists provide some comprehensive orthodontic services, and that 65 percent estimated that they spend more than 10 percent of their time providing orthodontic services. Comparing the current survey with previous surveys, Indiana pediatric dentists are providing more comprehensive orthodontic treatment and spend more time doing so than previous results showed.[1-3]

The current Indiana survey shows that general practitioners are also offering more involved orthodontic treatment as compared to previous surveys.[4,5] Of the responding general practitioners in the present survey, 17 percent stated they treated comprehensive orthodontic cases, 29 percent used functional appliances, and 23 percent used straight wire techniques.

The significant change in the amount of orthodontic treatment provided by general practitioners and pediatric dentists during the past few years can be attributed to a number of factors. Decreases in the incidence and prevalence of dental caries, increases in the number of dentists, and declining patient-populations could be powerful influences on the decisions by these dentists to offer more comprehensive treatment.

The differences between pediatric dentists and general practitioners in the survey were significant. Pediatric dentists treated a greater number of patients requiring comprehensive orthodontic treatment and spent more time doing so, than general practitioners. Probably the most influential factor in accounting for this difference is education. During their postgraduate training, pediatric dentists are trained in growth and development and occlusal guidance, and should be capable, therefore, of treating more complex occlusal problems.

The difference between pediatric dentists and general practitioners with respect to changing trends in the provision of restorative and orthodontic services is noteworthy. Pediatric dentists may be seeing a more significant reduction in the prevalence of dental caries in children, due to the use of pit-and-fissure sealants, better exposure to fluorides, and better-informed parents, as compared to the prevalence of adult caries, seen by general practitioners. Due to the more significant re-

duction of dental caries in children, pediatric dentists may have more time to spend on occlusal problems as compared to general practitioners.

More than a half of the general practitioners and nearly all pediatric dentists in the survey had attended some type of continuing education program in orthodontics. These results show that there is a demand for knowledge in orthodontics among general practitioners and pediatric dentists alike. This demand could be due to:

- ☐ A personal lack of expertise in the subject.
- ☐ A desire to improve the financial income from practice by expanding the scope of its clinical services.
- ☐ A general quest for new knowledge and skills.

When considering the total test group, the increased interest in continuing education programs in orthodontics was not significantly related to either practitioner-age or community-size. Superficially, one might have expected the increased interest in such courses to be limited to younger practitioners and practitioners in the larger communities. The trend, however, appears to be affecting all age-groups and those in all sizes of communities, equally.

As might be expected, practitioners who had attended continuing education courses spent significantly more time providing more complex orthodontic treatment than those who had not attended such courses. These practitioners undoubtedly had an interest in gaining new knowledge in orthodontics and are now providing more treatment in their practices as a result.

The ages of practitioners were found to have a significant effect on the trends in the provision of orthodontic and restorative services by the survey group, during past years. Younger practitioners tended to report a greater increase in the amount of orthodontic service provided. Older practitioners tended to report a decline in the number of restorative procedures provided. This difference could be due to the increased "orthodontic awareness" of more recent graduates and the noticeable decline in the restorative needs of the current population.

In this survey, the size of a community was significantly ($p < 0.01$) related to the percentage of time spent providing orthodontic services. More dentists in smaller communities (less than 25,000) tended to provide more orthodontic services. It is possible that no orthodontist was located in these smaller communities and that patients were unwilling to be referred to a specialist in a larger center. This factor was not investigated in this study.

CONCLUSIONS

The trend to increase orthodontic treatment by general practitioners and pediatric dentists as reported in past surveys continues. Both pediatric dentists and general practitioners surveyed in the state of Indiana are providing significantly greater amounts of orthodontic treatment, and of a more complex nature than shown by previous surveys.

Dentistry is a dynamic profession in which a multiplicity of variables affect the provision of patient care. This study has shown that the practice of dentistry over the past few years has changed greatly with respect to the provision of restorative and orthodontic services. In the future, dental care needs of patients will undoubtedly continue to change, thus requiring practitioners to be adaptable and willing to accept the challenges presented by these changes. Only by doing so can dentists continue to serve the public in the best tradition of the profession.

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This article is based on a thesis submitted in partial fulfillment of the requirements for a degree of Master of Science in Dentistry at Indiana University School of Dentistry, Indianapolis.

Interceptive orthodontics

Treatment of unilateral posterior crossbite: comparison of the quad-helix and removable plate

Reijo Ranta, DDS, Dr Odont

The prevalence of posterior crossbite in the primary, mixed, and permanent dentitions varies from 8 percent to 16 percent with a predominance of unilateral crossbite. Forced guidance in the transverse direction has been registered in most of these cases. One likely cause is the influence of dummy- and finger-sucking.[1-10] Early treatment with grinding alone results in correction in 27 percent of the cases, and spontaneous correction is observed in 21 percent.[11] It is recommended that treatment of posterior crossbite by grinding be started in the primary dentition. If there is no correction, an orthodontic appliance should be used in the early mixed dentition.[11] The quad-helix appliance is recommended, because the overall treatment time is shorter, and both the number of visits and the cost of treatment are lower, compared with removable appliances.[11,12] Few studies have been undertaken, however, to evaluate the efficacy of the quad-helix appliance, in the treatment of children with posterior crossbites.

The purpose of this study was to compare the quad-helix and removable plate appliances, retrospectively, with regard to efficacy of treatment. The total treatment time, number of visits, and total cost of treatment were also considered.

SUBJECTS AND METHODS

A total of fifty children with unilateral crossbite and laterally forced occlusion were studied retrospectively.

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Table 1 ☐ Mean age in years at the start of treatment and sex distribution in the two groups treated with quad-helix appliances and plates, respectively.

		Quad-helix group	Plate group
Age	Mean	8.6	7.6
	S.D.	1.6	1.1
	Range	6.2-11.9	6.2-9.5
Boys		9	11
Girls		16	14
Total		25	25

Table 2 ☐ Mean values and ranges for the variables used in the comparisons.

	Quad-helix group		Plate group	
	Mean	Range	Mean	Range
Total time of appliance therapy	3.8	2-6	21.6	12-30
Increase in arch width (mm)				
First permanent molars	3.6	2.0-5.8	3.7	1.8-7.2
Primary canines	3.2	1.2-5.6	3.8	1.1-6.3
Number of visits*	4.6	3-6	16.0	11-22
Number of appliances needed	1	1-1	1.7	1-3
Cost of appliances (US $)	58	58-58	174	102-307

*The posttreatment controls were not included.

The quad-helix group consisted of the first twenty-five children treated by the author at the Public Dental Service in the town of Lohja, during 1985-1986. The removable plate group consisted of the first twenty-five children treated by dental students under the supervision of orthodontic specialists, in the Department of Pedodontics and Orthodontics, University of Helsinki, during 1983-1984. The mean ages at the start of treatment for the two groups was 8.6 and 7.6 years, respectively (Table 1). The treatment visits occurred, usually every four to six weeks. No treatment other than maxillary expansion was performed during the observation period. The progress of the treatment was carefully noted in the dental records.

The transverse expansion was accomplished with a prefabricated .036" quad-helix (Rocky Mountain), soldered to bands on the maxillary first molars. Before cementation of the appliance, the quad-helix was expanded by 8-10 mm, keeping the outer buccal arms parallel to one another. This activation produced a force of about 450-550 g, measured unilaterally with a Correx (Haag-Streit, Bern) tension gauge. If additional expansion was necessary, the appliance was activated on its transverse bar with a three-jaw plier, directly in the mouth. After adequate expansion with a moderate overcorrection, the appliance was used for retention, for one to three months, without deactivation, and then removed. No occlusal interferences were eliminated by grinding the teeth before, during, or after the treatment.

The removable plates for transverse expansion had a midline screw (Forestadent) and Adams clasps on the permanent first molars and primary first molars or canines. The screw was opened by the patient or parent, a quarter-turn each week. Posterior bite planes were used in most cases. The children were instructed to wear the plates day and night, except during meals. After adequate expansion, the plate was used for retention for seven to twenty months, and then removed. The occlusion was checked for a year, following the termination of treatment.

The results of treatment were measured from dental casts made before treatment and again after nine months had elapsed since the end of the retention period, in the quad-helix group; and after eleven months, in the plate group. The widest intermolar distance of the maxillary first permanent molars and the intercanine distance of the primary canines were measured. Linear distances were measured with sliding calipers, to the nearest tenth of a millimeter. The dental records were used for registration of the complications, such as loose bands and broken appliances; the number of visits; and the length of the treatment period in months. The number of appliances, the laboratory costs, and the clinical treatment time formed the basis for a cost-benefit analysis. The clinical time of a visit was estimated to be equal in both groups.

RESULTS

Table 2 shows the comparisons between the groups treated with the quad-helix and removable plate. Forced occlusion and crossbite were eliminated in all cases. The total net results of expansion between the maxillary first permanent molars was 3.6 mm in the quad-helix group and 3.7 mm in the plate group at the end of their respective retention periods.

The total number of appliances needed was one per child in the quad-helix groups; and one to three appliances in the plate group, an average of 1.7 per patient. The average laboratory costs for the plate group were three times those for the quad-helix group; the average number of visits was 3.5 times, and the average treatment and retention time was 5.7 times those of the quad-helix group.

In the plate group, the average active expansion time was 11.0 months and the average retention period, 10.6 months. In the quad- helix group, treatment was accomplished in between four and ten weeks in all cases. The appliance was used for retention for one to three months after the crossbite was corrected. One additional intraoral activation was done in four of twenty-five patients. A girl complained of pain during the first week after insertion of the quad-helix appliance. No other complications were observed. In the plate group, the most frequent complications were poor cooperation, poor fit of the appliance, and broken or lost appliances.

DISCUSSION

The study shows the advantages of the quad-helix appliance over removable plates in the treatment of pos-

terior crossbite in the mixed dentition. This was also observed in an earlier study.[12] In the present quad-helix group, the amount of expansion was 8-10 mm, which represented a force of 450-550 g. A similar activation of the quad- helix appliance is recommended by others.[13,14] This force seems appropriate in most cases to correct the crossbite without additional activations. Moreover, the appliance is appropriate for retention without removing it and inactivating it. A moderate overexpansion is recommended.

Hermanson *et al* used prefabricated .038 quad-helix (Rocky Mountain) soldered to molar bands with expansion by 5 mm with a resulting force of 350-400 g.[12] The average total treatment period was eight months, including a two-to-four-month retention period with a new quad-helix appliance. The children were treated by general practitioners under the supervision of an orthodontic specialist. The most frequent complications in their group were twenty-nine loosened bands and five broken appliances. The mean cost of treatment was 40 percent higher in their plate group than in their quad-helix group. In the present quad-helix group, the total treatment time (3.8 months) was less than half that of the corresponding group of Hermanson *et al.*[12] In the present plate group, the active treatment period was the same as the Hermanson group, but the retention period was longer.

Pediatric dentists are responsible for diagnosing the need for occlusal therapy in the developing dentition. The prevalence of unilateral crossbite is high and mostly associated with forced guidance in the transverse direction. The diagnosis and treatment of these functional crossbites are simple, and any pediatric dentist can accomplish them. It is important to know the treatment variables and their respective results. The quad-helix is easy to adjust, is effective, inexpensive, independent of the patient's cooperation, and convenient for patients. Both the selection of the appliance and its method of use are important. The molar bands should be carefully selected and adapted before fabrication of the quad-helix appliance, to avoid their loosening. Intraoral activation can be used, but extraoral activation allows the amount of activation to be clearly observed and is the preferred method, despite the extra work of removing and recementing the appliance.[15] The present treatment rationale with the quad-helix appliance is recommended for use in correction of unilateral crossbite in the mixed dentition period.

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Patient's age at the initial detection of interproximal caries

Clinic

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Maximizing the benefit-to-risk ratio of dental radiographic examinations for children has been of great concern in recent years, even though the use of bitewing radiographs for interproximal caries detection has been substantiated.[1-10] Nevertheless, routine use of bitewing radiographs at semiannual examinations is contraindicated.[1-4]

Factors that put patients at risk of dental caries have been suggested for use as criteria in determining the proper time and frequency of bitewing examination for children.[4,11,12] Patients at high risk for interproximal caries should receive radiographic examinations more frequently than those of relatively low risk. Bitewing intervals of six to twenty-four months have been suggested.[4,13]

Studies of the rate of progression of interproximal caries show that caries reaches the dentinoenamel junction in primary teeth more rapidly than in permanent teeth.[14-16] Consequently, bitewing radiographic examinations of primary teeth in contact would appear to be

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indicated more frequently than of permanent teeth in contact.

Another factor in determining the time of bitewing radiographic examinations in children is the stage of development of the dentition: for example, how long proximal surfaces have been at risk for caries.[11,17]

Hennon *et al* reported that caries in children, thirty-six to thirty-nine months of age, is usually found on occlusal, buccal and lingual surfaces.[8] By age six to seven years, the prevalences of interproximal and occlusal caries are approximately equal.[18,19] Earlier studies reported that the prevalence of interproximal caries in primary posterior teeth peaks at about age seven years.[18,20] The peak in permanent teeth occurs after age twelve years.[20,21] The detection of interproximal caries is particularly important during these peak periods.

Parfitt demonstrated the role of interproximal spacing in the development of interproximal caries.[22] The incidence of caries in teeth with less than 0.5 mm of interproximal space was ten times greater than the incidence in teeth with open contacts. In addition, Parfitt reported that the incidence of caries on the tooth surfaces contiguous to the spaces between the mandibular first and second primary molars of four-year-old children was greater than on the surfaces contiguous to the spaces between the mandibular primary canines and primary first molars.[22] Ninety-three percent of the primary molars sequences had closed interproximal contacts, while only 42 percent of the canine-molar sequences were closed. The caries susceptibility of posterior interproximal surfaces appears to be influenced by whether or not those surfaces contact other teeth. It is possible that the peak periods of incidence of interproximal caries reported by Nordblad and Larmas, Parfitt, and Walsh and Smart, represent surfaces at risk for a specific period of time, after establishment of interproximal contact.[18,20,21]

A semilongitudinal study of caries incidence in children, ages seven to fifteen years, emphasized the importance of each interdental unit as a factor in determining the time of onset of a caries lesion.[21] Since the dentitions of children are continually changing, the period during which specific tooth surfaces would be at risk for caries varies. More information on the time of onset of interproximal caries for specific tooth surfaces would be helpful in determining what constitutes proper radiographic examinations for children.

Studies of the incidence, prevalence and distribution of interproximal caries showed peaks for cumulative interproximal caries scores.[8,18-24]

Many of the studies were conducted before the recently reported decrease in caries prevalence in children.[25] The purpose of the present longitudinal study was to determine the age at which the initial detection of interproximal caries for specific tooth surfaces in children was made. This additional information may allow for more selective use of bitewing radiographic examinations for children.

Table 1 ☐ Interproximal caries distribution by tooth surface.

Tooth surface	Maxillary	Mandibular	Total
Primary canine, distal	3	9	12
Primary first molar, mesial	7	11	18
Primary first molar, distal	43	57	100
Primary second molar, mesial	35	40	75
Primary second molar, distal	16	25	41
Permanent first molar, mesial	23	24	47
All surfaces	127	166	293

METHODS AND MATERIALS

The present study was a retrospective review of the records of 100 patients selected at random from the records of a private practice in pediatric dentistry. All patients had been examined by either JEK or RFN and had had interproximal caries. Four records were excluded from the data analysis, since they contained less than four sets of bitewing radiographs in four years. The patients had all been seen for regular recall treatment, which included oral hygiene instructions, professional prophylaxis and topical fluoride applications. Systemic fluoride supplements were prescribed for children from areas with less than optimum levels of fluoride in the drinking water.

The ages of the patients at their initial examinations ranged from two to fourteen years, with a mean age of 5.7 years. The sample included fifty-six girls and forty boys.

All diagnoses of interproximal caries were made from bitewing radiographs. A lesion was recorded at the first sign of a defect in the enamel. Lesions were only recorded, if the previous radiographic examination was negative for interproximal caries, on that specific tooth surface.

Lesions diagnosed radiographically at the first visit were excluded from the data analysis, because the actual time of initial detection could not be documented as accurately as for those lesions for which a previous set of radiographs was available.

All radiographs were examined once by either JEK or RFN with the aid of a viewbox in a dimly lighted room. Only records with radiographs of a predetermined diagnostic quality were used.[13]

Before beginning this study, a pilot study was completed. Twenty- two cases were evaluated by the two principal investigators, using the criteria listed above.

Table 2 ☐ Age of initial detection of caries by tooth surface, maxillary teeth.

	Permanent first molar	Primary second molar		Primary first molar		Primary canine
Tooth surface	Mesial	Distal	Mesial	Distal	Mesial	Distal
Mean age (yrs.)	11.41	9.28	7.93	7.31	7.62	6.26
S (yrs.)	1.87	1.43	1.68	1.61	2.11	1.46
Range (yrs.)	8.27 to 15.32	6.89 to 11.82	4.51 to 11.08	3.76 to 10.82	4.63 to 10.70	4.63 to 7.45

Table 3 ☐ Age of initial detection of caries by tooth surface, mandibular teeth.

	Permanent first molar	Primary second molar		Primary first molar		Primary canine
Tooth surface	Mesial	Distal	Mesial	Distal	Mesial	Distal
Mean age (yrs.)	11.66	9.07	6.92	6.94	7.04	7.32
S (yrs.)	2.91	1.36	1.59	1.81	1.90	1.74
Range (yrs.)	8.04 to 20.95	5.85 to 10.75	4.46 to 10.88	3.78 to 11.25	3.93 to 9.68	4.60 to 9.66

The primary purpose of the pilot study was to assess the percent agreement between the two evaluators. The percent agreement for detection of interproximal caries was 79.1 percent. Based on the level of this agreement, it was decided that radiographs in the study would be evaluated by either principal investigator.

The patient's chronological age was recorded at the time each interproximal lesion was detected. The average age of initial detection of caries was then calculated for each of the following tooth surfaces:

- ☐ Distal surface of the primary canine.
- ☐ Mesial surface of the primary first molar.
- ☐ Distal surface of the primary first molar.
- ☐ Mesial surface of the primary second molar.
- ☐ Distal surface of the primary second molar.
- ☐ Mesial surface of the permanent first molar.

Surfaces of teeth from both the right and left sides were combined for calculation of *average age of initial detection of caries*, since the right to left correlation has been reported to be high.[26,27] Separate calculations were done for maxillary and mandibular teeth.

RESULTS

Distribution of interproximal caries by tooth surface

A total of 293 interproximal lesions were recorded for the ninety-six patients examined. The distribution of interproximal caries by specific tooth surface is given in Table 1. More lesions were detected in mandibular teeth than in maxillary teeth for each tooth type. The greatest number of dental caries lesions was seen in the mandibular primary first molar. The maxillary primary canine was found to be carious least often.

Average age of initial detection of caries

The average patient's age at the time of initial detection of interproximal caries for each tooth surface ranged from 6.3 years for the distal surface of the maxillary primary canine to 11.7 years for the mesial surface of the mandibular permanent first molar. The data for maxillary and mandibular tooth surfaces are given in Tables 2 and 3, respectively.

Distribution of interproximal caries by age of patient

Figures 1 and 2 show the distribution of interproximal caries by specific tooth surface and by age group. Peaks in *patient's age at initial detection of interproximal caries* occurred between ages seven and eight years, in maxillary primary teeth; and between ages six and seven years, in mandibular primary teeth. Caries on the mesial surfaces of maxillary and mandibular permanent first molars did not occur until after the age of eight years, and an average of initial detection of 11.5 years.

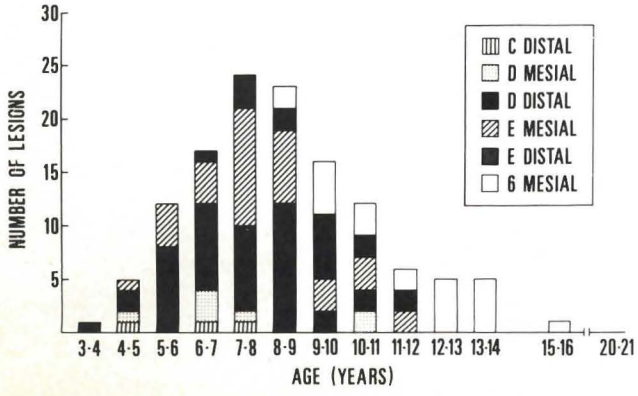

Figure 1. Distribution of interproximal caries by age, maxillary teeth.

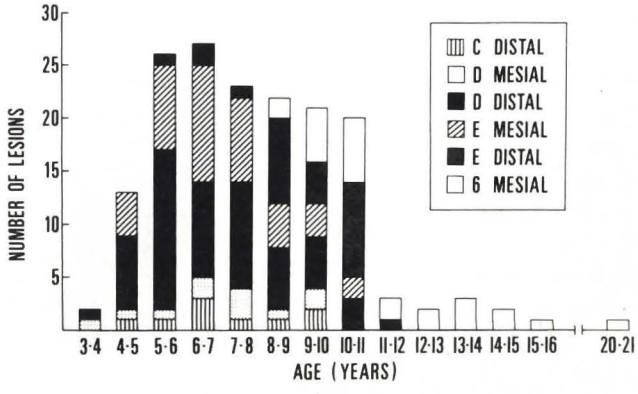

Figure 2. Distribution of interproximal caries by age, mandibular teeth.

DISCUSSION

Distribution of interproximal caries by tooth surface

The greater incidence of interproximal caries in mandibular teeth in the present study is consistent with the findings of Hennon *et al*, and Parfitt.[8,22] Glass *et al* also reported a greater incidence of caries in mandibular teeth.[24] The data of Glass *et al* were not limited to interproximal caries. The greater incidence of interproximal caries in mandibular teeth may be related to a greater incidence of closed interproximal spaces as reported by Parfitt, in a study of children four years and older.[22] The earlier eruption of mandibular teeth may also explain the greater incidence of interproximal caries.[28,29]

The incidence of interproximal caries was greatest for the distal surface of the primary first molar, in the present study. This finding is consistent with the findings of Hennon *et al*, Parfitt, and Varpio.[8,19,22] The ratio of caries incidence on the distal surface of the primary first molar to that of the adjacent mesial surface of the primary second molar in the present study was 1.33/1, which is close to the ratio of 1.31/1 reported by Parfitt.[22]

Average age of initial detection of caries for each tooth surface

Interproximal caries occurred earlier in mandibular primary molars than in maxillary primary molars, in the present study. This finding may be explained by the earlier eruption of mandibular primary molars.[28,29] The time of occurrence of a caries lesion on one primary molar surface is similar to that on the adjacent primary molar surface. Similar caries susceptibility of adjacent primary molar surfaces was reported by Parfitt.[22] The average age for caries development on the mesial surface of the permanent first molar, however, was approximately two years later than for the contacting distal surface of the primary second molar. This difference may be the result of the slower rate of lesion progression in permanent teeth as reported by Zamir *et al*, Pitts, and Shwartz *et al*.[14-16]

The peak in *patient's age at initial detection of interproximal caries in primary teeth* in the present study was between six and eight years. This is in agreement with caries incidence reported by Parfitt, Varpio, and Walsh and Smart.[18-20]

The average *patient's age at initial detection of caries on the mesial surface of permanent first molars* in the present study was 11.5 years. Parfitt, Nordblad and Larmas, and Walsh and Smart reported a peak age of twelve years for interproximal caries in permanent first molars.[18,20,21]

These peaks emphasize the importance of the length of time during which surfaces are at risk for caries as a factor in determining the times at which bitewing radiographic examinations should be made.[11,17,21] This factor may be particularly useful in determining the frequency of bitewing radiographs for children seen on a regular recall basis. The practitioner would know how long teeth have been in proximal contact and, consequently, at risk.

Bitewing radiographs have been recommended more frequently for children with primary tooth contacts.[4] The children in the present study had primary, mixed and early permanent dentitions. The posterior interproximal surfaces of children in the mixed dentition were at risk for caries, for the longest period of time. The results of the present study suggest that children with mixed dentitions and with primary teeth in contact showed the highest incidence of interproximal caries radiographically. Bitewing radiographs may be indicated more frequently, therefore, during the mixed dentition period than during the periods of the primary and early permanent dentitions.

Lesions detected at the initial visit were excluded from the study and this may have biased the sample. To evaluate whether any bias occurred in the study results, a second calculation of data was made by combining lesions detected at the initial visit with the data of this study.

No consistently different pattern could be detected, when combined data were compared with the study's sample data. Of the twelve surface types, four surface types showed higher mean ages, when the initial visits were included, and seven revealed lower mean ages, when the initial visits were included. For one surface type, only one lesion was recorded at the initial visit. The differences between groups (combined data and sample data) ranged from 0.01 to 0.32 years with a mean difference between groups of 0.16 years (1.9 months). The magnitude of these differences is generally less than the time between recall visits. Consequently, exclusion of lesions recorded at the initial examination resulted in no clinically significant difference in the mean ages at which the caries lesions were first detected.

CONCLUSIONS

For patients in primary through early permanent dentition stages:

- ☐ Interproximal caries is most prevalent on the distal surface of primary first molars.
- ☐ Interproximal caries is more prevalent in mandibular teeth than in maxillary teeth.
- ☐ Interproximal caries develops earlier in mandibular primary molars than in maxillary primary molars.
- ☐ Caries development on the mesial surfaces of permanent first molars is slower than for the distal surfaces of the adjacent primary second molars.
- ☐ Peaks in initial detection of interproximal caries in primary posterior teeth occur between six and eight years of age. Interproximal caries first occurs on the mesial surfaces of permanent first molars on the average between eleven and twelve years of age.

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Clinical validity of the relationship between TMJ signs and symptoms in children and youth

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A primary problem in all clinical research is establishing the relationships between symptoms subjectively reported by the patient and the clinical findings objectively gathered. Subjective or symptomatic data obtained through questionnaires or structured interviews are often variable for a number of reasons:

- ☐ The types of questions posed.
- ☐ The manner of putting the questions.
- ☐ The patient's interpretation of the questions, among others.

There are no common standards for the collection or the interpretation of such subjective data. Problems associated with clinical research have been the focus of much recent effort in medicine and a new field termed *clinical epidemiology* has emerged, whose purpose is to bring to clinical research the rigors of statistical design common in experimental medicine and biology.

Attempts have been made to apply some of the research strategies of clinical epidemiology to the problems of adult temporomandibular dysfunctions; a standard questionnaire of known reliability has been developed and is extensively used for epidemiological research.[1-12] The clinical relevance and biological meaning of these findings, however, have yet to be demonstrated.

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MATERIALS AND METHOD

One way to gain information about the clinical relevance and biological relationship between reported symptoms and clinical signs of TMJ dysfunction is to study their correspondence or independence. The statistical results are apt to be model dependent and expressed as deviations from a particular statistical, not a biological, model assumed to represent "no interaction". Assessment of interaction between variables within a data set depends on how one defines "no interaction". Clinical epidemiology deals with this problem by testing for correspondence and independence of data.

The present study was designed to test whether or not well-documented associations between temporomandibular signs and symptoms have any clinical validity with respect to correspondence.

The data were obtained from a cross-sectional, epidemiological survey of 1342 subjects, six to nineteen years of age, which included both a structured interview and a standardized clinical examination (Table 1). The

Table 1 ☐ Number of males and females by age-group.

Sex	6-8 yrs	9-10 yrs	11-12 yrs	13-14 yrs	15-17 yrs
Males	187	123	180	141	36
Females	164	131	184	135	54
Total	351	254	364	276	90

frequency of subjectively reported symptoms and clinically observed signs of temporomandibular joint dysfunction was analyzed (Table 2).

The interview consisted of five questions, each designed to elicit information about one or more of the following symptoms: temporomandibular joint sounds, pain, headaches, earaches, limited movements, and bruxism. The questions were:

- ☐ Do you have any pain or tiredness in the jaws while chewing such things as gum?
- ☐ Do you have any problem in opening your mouth wide?
- ☐ When you open your mouth, do you notice any noises in your ears?
- ☐ Are you aware or has anyone told you that you grind your teeth?
- ☐ Do you have any unusual frequency of headaches or earaches?

This format was used by Brandt, Riolo *et al*, and a similar one by Helkimo in their studies of occlusion and signs and symptoms of temporomandibular disorders.[3-5,13,14] All questions were answered "yes", "no", or "do not know". Questions not understood were repeated to the patient. Care was taken not to influence the patient's answers.

Recorded clinical signs of temporomandibular dysfunction were: limitations of mandibular movements, locking of the mandible, pain on movement, crepitus, and joint or muscle tenderness. Details of the sample, methods, and data collection can be found in Brandt, and Riolo *et al*.[13,14]

In order to evaluate the extent to which the clinical examination and the interview-questionnaire measure the same thing, we analyzed the signs and symptoms seen in Table 2 for independence and correspondence of information. Independence was measured using the Chi-square test, a significant p-value indicating statistical dependence or association between the sign and symptom tested. Correspondence of each symptom-related question to a clinical sign was measured by the *sensitivity*, the *specificity*, and the *false-positive* and *false-negative error-rates* of the question, using the information obtained from the clinical examination as a standard.[16]

Table 2 ☐ Frequencies for yes and no categories of each of subjective symptoms and clinical signs.

	No	Yes
Subjective symptoms		
Pain	1024	296
Limited opening	1276	61
Noise	1068	258
Grind	1063	248
Headache	1040	289
Clinical signs		
Clicking	1204	116
TMJ pain	1213	107
Muscle pain	1113	207

Table 3 ☐ Computation of false-positive and false-negative rates and measures of sensitivity and specificity for subjective interview questions using the clinical exam as a standard.

Subjective symptom	Clinical sign	
	No	Yes
No	a	b
Yes	c	d

False-positive = c/(c+d); False-negative = b/(a+b); Sensitivity = d/(b+d); Specificity = a/(a+c).

Sensitivity

Sensitivity is the probability of correctly identifying a disease (clinical sign of TMJ dysfunction) using a screening test (interview questionnaire). Statistically, sensitivity is defined as the conditional probability of a positive response to a question given the presence of a clinical sign.

Specificity

Specificity is the probability of correctly identifying an asymptomatic (no clinical signs of TMJ dysfunction) person with a screening test (the questionnaire). In other words, specificity is the conditional probability of a negative response to a question given the absence of a clinical sign.

False-positive and false-negative rates

The false-positive rate is the probability of not displaying a clinical signal, although a symptom has been reported.

The false-negative rate is the probability of displaying a clinical sign given that a symptom has not been reported.

The cross-sectional design of the study allowed us to compute the limits of independence and correspondence directly from the data. Tables 3 and 4 show the computation of the sensitivity, specificity, and false-positive, and false-negative rates for the interview questions, using the clinical examination as a standard.

RESULTS

Correspondence

In general, correspondence between symptoms and clinical signs was poor in two respects:

- ☐ The capability of the questions to detect clinical

Table 4 ☐ False positive and false negative rates and measures of sensitivity and specificity for subjective interview questions using the clinical exam as a standard.

Comparison		Group	False pos.	False neg.	Sen.	Spec.	Sig.
Subjective	Clinical						
pain	any	all	57	27	31	82	****
		6-12 yrs	58	26	34	80	****
		13-17 yrs	56	29	25	86	*
open	any	all	67	30	5	96	ns
		6-12 yrs	66	30	6	95	ns
		13-17 yrs	71	31	2	98	ns
noise	any	all	55	26	29	85	****
		6-12 yrs	56	26	29	85	****
		13-17 yrs	52	27	30	86	***
grinding	any	all	69	30	19	81	ns
		6-12 yrs	70	30	20	80	ns
		13-17 yrs	65	30	17	86	ns
headache	any	all	61	28	28	81	****
		6-12 yrs	62	27	29	80	**
		13-17 yrs	60	29	24	84	ns
pain	muscle/pain	all	74	13	37	80	****
		6-12 yrs	78	12	40	78	****
		13-17 yrs	67	16	31	86	**
noise	muscle/pain	all	74	13	33	83	****
		6-12 yrs	77	12	32	83	***
		13-17 yrs	65	14	36	85	***
pain/open	any	all	59	27	33	80	****
		6-12 yrs	59	26	36	78	***
		13-17 yrs	57	28	25	85	*
pain/open	pain/open	all	67	21	34	79	****
		6-12 yrs	66	21	36	77	***
		13-17 yrs	67	21	26	84	*

* $0.01 < p < 0.05$
** $0.001 < p < 0.01$
*** $0.0001 < p < 0.001$
**** $p < 0.0001$
Sen. and spec. mean sensitivity and specificity as defined in the text.
Sig. means p-value of the chi-square test of association between the corresponding subjective and clinical questions.
For symptoms, "pain" includes pain or tiredness in jaws during chewing; "open" means "any problem in opening the mouth."
For clinical signs, "any" means at least one of the signs is present; "muscle pain" means at least one of temporalis, masseter, medial or lateral pterygoid muscle pain; "pain" includes TMJ or muscle pain; and "open" means restricted jaw opening less than 35 mm.

signs of dysfunction (sensitivity).

☐ The tendency of the tests to yield false-positive indications of signs of dysfunction (Table 4).

Independence

Tests for independence of signs and symptoms within our data indicated significant associations (Table 4).

In the best possible situation, clinical tests should show significant associations and correspondences. Table 4 reveals that although there are many significant associations between subjective reports and objective clinical findings, there is poor correspondence as indicated by the high false-positive rates and low sensitivity.

DISCUSSION

These findings challenge the clinical validity of the frequently reported, statistically significant associations between TMJ signs and symptoms: for example, Brandt, Helkimo, Nilner, Nilner and Lassing, Egermerk-Eriksson, and Egermerk-Eriksson *et al.*[3-5,13,16-19] For example, Brandt and Nilner reported strong associations between symptoms and observed signs of TMJ dysfunction.[13,16] In this context, it is of interest to note that computation of Helkimo's composite false-positive and false-negative rates differ from our own by only 1 percent (40 and 41 percent, respectively). It seems illogical to assign significant clinical validity or biological relevance to findings whose summated false-negative and false-positive rates are so high.

Since our data were collected from children, we should not use them to impugn the validity of adult studies, but rather to suggest research similar to that in this report may be indicated for older subjects.

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A CATCH IN THE REYE

It is not unexpected that studies would begin to report an associated decline in the incidence of Reye syndrome in the United States commensurate with a decline in aspirin use. Critical review of the national data suggests a decline in the incidence of Reye syndrome beginning before the public awareness campaigns (1982). It is interesting to note that the incidence of Reye syndrome appears to be declining in Australia also, despite lack of association of Reye syndrome with aspirin use. There is no reason to believe that Reye syndrome is a different disease in the United States than in Australia. The cause or causes of Reye syndrome remain a mystery. It is unlikely that the purported association of Reye syndrome with aspirin use is anything more than coincidental.

Orlowski, J.P. *et al*: A Catch in the Reye.
Pediatrics, 80:638-642, November, 1987.

Disturbed eruption of the lower second molar: clinical appearance, prevalence, and etiology

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Boel Wellfelt, DDS

Disturbed eruption of the lower second molar is a rare condition.[1-3] Because its treatment is accompanied by a number of difficulties, particularly in the presence of a third molar, it was decided to study this aberration in a group of patients and to evaluate the results of various treatment modes. Descriptions of the initial status of the subjects of the study are presented in this paper. In a second paper, the treatment modes and their results will be discussed.

MATERIAL AND METHODS

The study population was comprised of eighty-eight patients, born between 1960 and 1974 and referred to the Pedodontic Clinic at Sociala Huset during the years 1975-1985, by orthodontists and general practitioners in the Public Dental Service in the city of Göteborg, Sweden. Like all Swedish children, the subjects were examined annually at their local clinics, from the age of six to sixteen years; until 1974, when the Dental Health Program was expanded to include all children between three and nineteen years of age.

The patients included in the study had either totally or partially impacted lower second molars. For this study, the term "impacted" indicates a molar that remains unerupted beyond the time when it should normally erupt, or when it is obvious that it is not going to erupt spontaneously.

The cases were recorded on periapical radiographs, in many instances supplemented by orthopantomograms and axial radiographs. The paths of eruption were also followed retrospectively in series of annual bite-wing radiographs.

The angulations of the molars were classified in one of three categories, according to the main deviation from the normal: mesioangular, distoangular, and vertical (Figures 1,2,3). A few molars showing a slightly lingual tilt were classified as vertical.

Conventional procedures were used for statistical analysis.

RESULTS

Clinical appearance

The distribution of the patients according to sex and age at the time of referral is presented in Figure 4. There were more males than females, fifty-six and thirty-two, respectively. The observed proportion of males, fifty-six of eighty-eight, differs significantly from the expected proportion 0.510 ($p < 5\%$ two tailed exact binomial test). Most patients were referred between fourteen and eighteen years of age (the mean age was 15.4 years). Patients with partially erupted molars were referred at a later age (15.9 years) than patients with totally impacted molars

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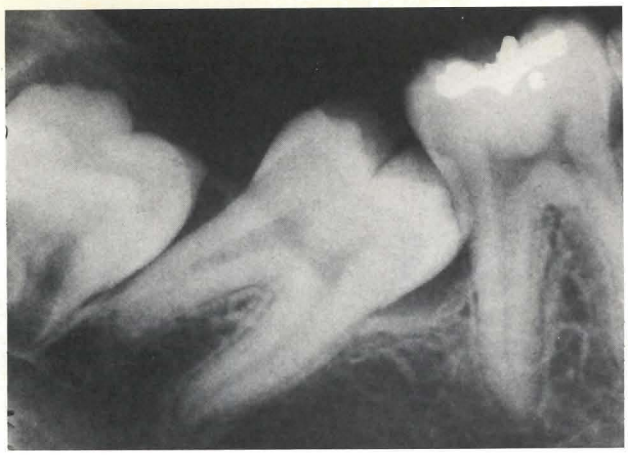

Figure 1. Lower second molar impacted in mesioangular position.

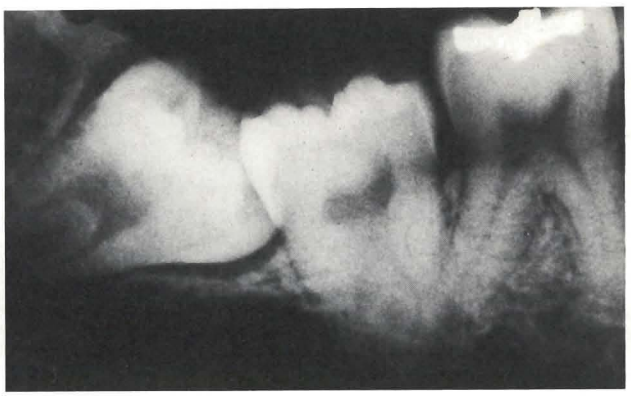

Figure 2. Lower second molar impacted in distoangular position.

(14.7 years). The distribution of the 108 malpositioned molars according to side and angulation is presented in Figure 5. Bilateral malposition was seen in twenty patients, corresponding to 23 percent. Among the sixty-eight patients with unilateral impactions, forty-five impactions were seen on the right side. The difference between the proportion of patients with a malpositioned molar on the right side and on the left side, respectively, is highly significant ($p < 1\%$, the Nemar's $X^2 = 7.67$). No significant association was found between sex and right/left side impaction ($p = 66\%$, Pearson's $X^2 = 0.19$). Molars in a mesioangular position were most frequent (forty-six) while there were almost as many molars in a distoangular as in a vertical position (thirty-two and thirty, respectively).

Figure 3. Lower second molar impacted in vertical position.

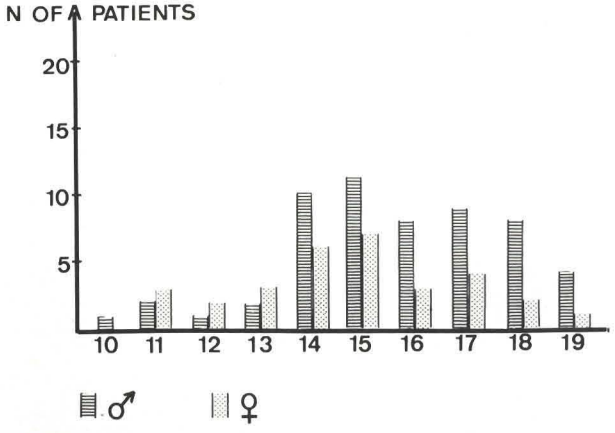

Figure 4. Distribution of the eighty-eight patients, according to sex and age at the time of referral.

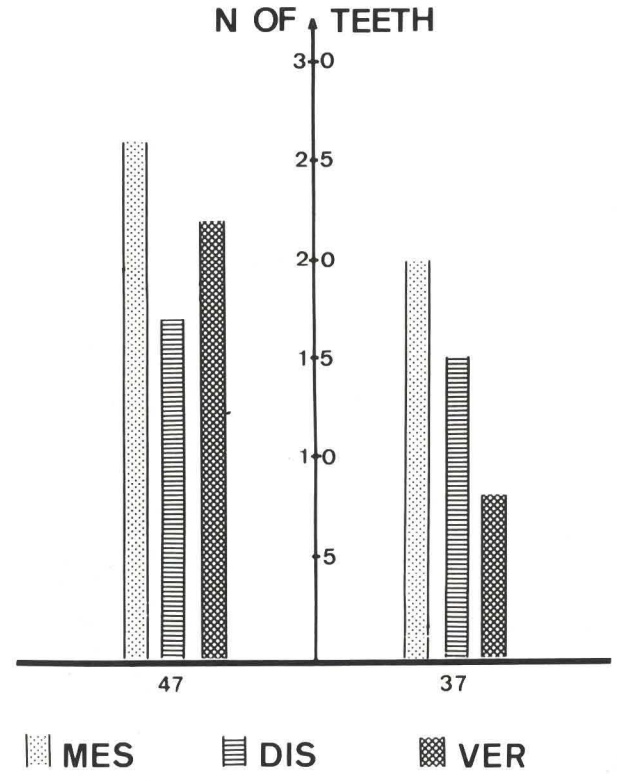

Figure 5. Distribution of the 108 lower second molars, according to side and angulation.

The proportion of totally impacted teeth was 43 percent (Figure 6). In the same figure, it can be seen that most molars in a distoangular position were partially erupted: twenty-six of the thirty-two distally inclined teeth. Most vertically positioned molars belonged to the totally impacted group (nineteen of thirty); whereas, molars in a mesioangular position were rather evenly distributed.

Crowding in the molar region was seen as a rule. In only three individuals was there not a lack of space. All but five of the eighty-eight patients had a third molar adjacent to the affected second molar. Three of the five patients with third molar aplasia showed space shortage for the second molar (Figure 7).

Malocclusion, locking the teeth in an unfavorable position, was seen in cases with partially erupted, mesially or distally inclined molars. Linguoclusion of the mandibular second molar was seen in six cases. A frequent clinical feature of the molars with distal tilts was the absence of attached gingiva, buccally and distally. Instead, freely retractable gingiva was present.

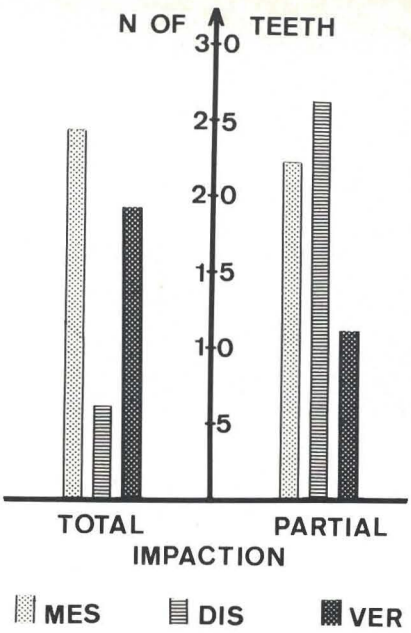

Figure 6. Distribution of the 108 lower second molars between total and partial impactions in relation to angulation.

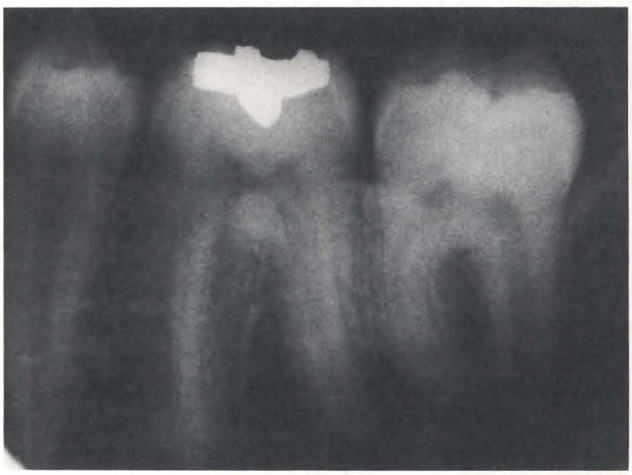

Figure 7. Shortage of space for an impacted lower second molar, in a case of third molar aplasia.

Figure 8. Impacted lower second molar with a follicular cyst.

Prevalence

To estimate the prevalence of impacted lower second molars, the number of referred patients born during ten consecutive years from 1961 to 1970 was counted. There were seventy-five patients with one or both lower second molars impacted; thirty-five of the teeth were totally impacted. As each age-group in Göteborg consisted of approximately 5000 individuals, during the years concerned, the prevalence of disturbed eruption as a whole is 1.5 per thousand, or, calculated for the thirty patients with total impaction, 0.7 per thousand.

Etiology

Crowding was a frequent feature. As mentioned before, all but three individuals showed lack of space in the region of the impacted tooth. About half of the patients, forty-seven of eighty-eight, also exhibited general crowding or had received orthodontic treatment.

Apart from crowding, other anomalies were found in twenty-one patients. In each of four patients, a follicular cyst of the lower second molar was verified (Figure 8). Two individuals had a supernumerary tooth in the region of the second molar (Figure 9). In two patients, the first molars were late to erupt and had to be denuded before they erupted. One patient had multiple aplasias. General retardation of tooth eruption was diagnosed in six patients. The gingiva covering the impacted tooth was

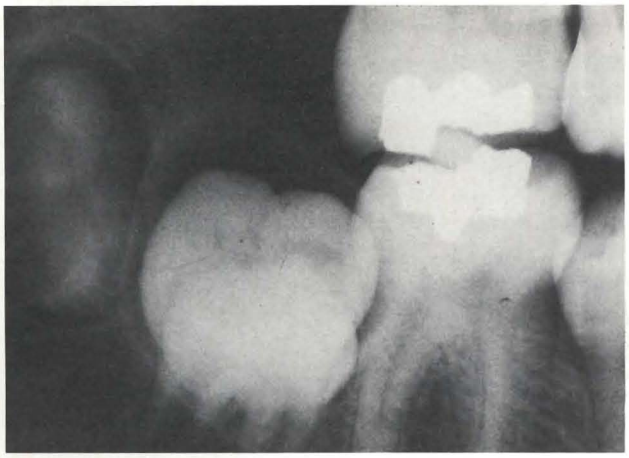

Figure 9. Impaction of a lower second molar, caused by a supernumerary tooth.

Figure 10. Vertical impaction of a lower second molar with complicated root anatomy and ankylosis.

regarded as fibromatose in six patients, in one of whom this diagnosis was histologically verified. Ankylosis was suspected in six cases, which also showed complicated root anatomy (Figure 10). The tooth position was classified as vertical in fifteen of the twenty-one patients with these anomalies.

DISCUSSION

The occurrence of totally impacted lower second molars is low, compared, for example, with third molars or second premolars; and reliable statistical information, furthermore, is rare, because most authors make no distinction between partial and total impaction. The occurrence is often expressed as the percentage of all retained teeth in a group of patients, not as the prevalence in a population. From studies that present detailed information on the impaction of different teeth, the following prevalence figures can be calculated: in an investigation of impaction among Chinese and Caucasians, based on a study of 3260 complete oral radiographs, the prevalence of impaction of the lower second molar is 0.9 per thousand.[1] A higher prevalence, three per thousand, was found in the radiographs of 1032 individuals, eight to eighteen years old, presenting three mandibular second molars with delayed emergence.[2] In radiographs of 5000 American recruits, the prevalence of impacted lower second molars was 0.6 per thousand.[3]

The prevalence in this study is calculated on selected subjects. The children in Göteborg, however, have been screened annually, and referral routines within the Public Dental Service are well established, for the Pedodontic Clinic has been functioning as a referral clinic, since the early 1970s. Nevertheless, the prevalence is probably underestimated, since some cases might have been treated by orthodontists or oral surgeons. In general, the patients were referred late, often after several years of observation.

Bilateral retention seems to be related to general crowding. The same background can also be seen in unilateral cases where unilateral premolar extraction has allowed the second molar to erupt on the extraction side but left the same tooth impacted on the nonextraction side. The prevalence of impacted lower second molars might thus be related to the treatment philosophy among local orthodontists. If expansion is preferred to extraction in cases of slight crowding, the prevalence of impacted lower second molars will increase.

The predominance of male patients as well as that of impaction on the right side of the mandible were unexpected findings. Summarizing the available data on *sex* and *side of impaction*, in six studies, twenty-nine patients were males and twenty-six were females, and twelve impacted lower second molars were found on the right side and nine on the left side.[1,2,4-7] The larger tooth size of the males, when combined with insufficient skeletal dimensions, may explain the predominance of these cases, in males. It was also suggested that ectopic eruption has a familial tendency with reduced penetrance in girls.[8] Since patients in this study did not show any obvious facial asymmetry, the preponderance of these cases on the right side of the mandible could be due to discrepancies between right and left mesiodistal crown diameters. In fact, a study of patients with irreversible impaction of the maxillary first permanent molars showed wider molars on the right side.[8] Other investigations, however, show a high correlation between the right and left crown widths.[9]

Among the three categories of angulation, impaction

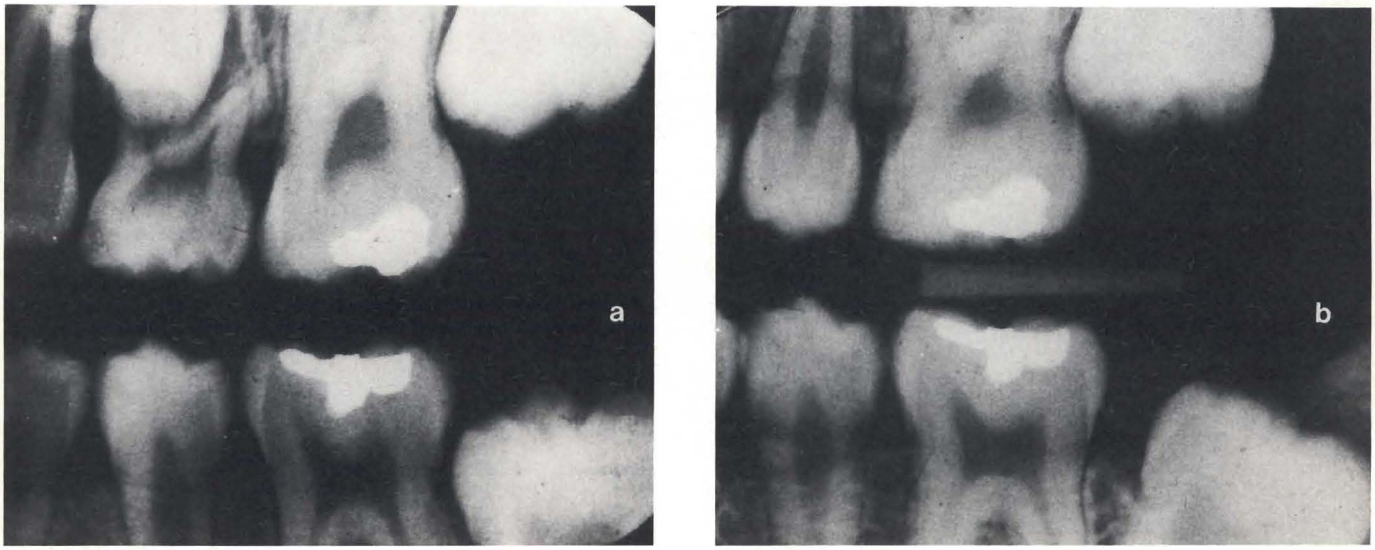

Figure 11. Disturbed eruption of a lower second molar.
a. At the age of thirteen years.
b. At the age of fifteen years.

in mesioangular and distoangular positions seems mostly to have been caused by lack of space, while there appears to have been a number of local factors behind the vertical impactions. Ankylosis is not easy to diagnose clinically. A high pitch of the percussion sound was not a typical finding, nor was the absence of the periodontal space in radiographs. This problem has been discussed in connection with first permanent molars in infraclusion that do not show any bony ankylosis. Instead, a fibrillary ankylosis formed by the periodontal fibers could be reason enough to prevent eruption.[10] The diagnosis of ankylosis in this study was based on clinical observations, during the extraction of the tooth.

Whether a predisposition to impaction is characteristic of a certain type of occlusion could not be resolved, because of the retrospective character of the study.

When series of bite-wing radiographs are studied, diversion in the eruption of a tooth toward unilateral impaction can be detected early by comparing with the normal side. As a rule, a positional deterioration of the impacted tooth occurs (Figures 11a, 11b). This is often caused or aggravated by the developing third molar, which will be a complicating factor in treatment planning.

The authors are greatly indebted to Dr. Robert Jonsson, Department of Statistics, University of Göteborg, for statistical advice, and to the Public Dental Service in Göteborg for financial support.

CONCLUSIONS

Space shortage is definitely the most frequent cause of impaction of the lower second molars. Vertical impaction calls for particular attention, since its etiology is more diversified. Early analysis of the occlusion should include, therefore, the posterior areas of the jaws, to prevent unnecessary complications.

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The retention of fissure sealants using twenty-second etching time: three-year follow-up

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Milton Houpt, DDS, PhD

Recently, it was found that twenty seconds etching time produced results comparable to those obtained with the conventional sixty seconds. Similar etching patterns and degrees of surface irregularity were reported, as well as comparable degrees of marginal microleakage and retention of fissure sealants.[1-7] The aim of this study is to evaluate the retention of fissure sealants after three years, using twenty seconds etching time.

MATERIALS AND METHODS

Thirty-eight first-grade children were selected from ninety children attending a public dental clinic in Jerusalem, Israel. The criterion for selection of the sample was the presence of at least one caries-free first permanent molar. Since the children ranged in age from 5.5 to 6.5 years, some of them retained residual gingival tissue on the occlusal surfaces. In maxillary teeth with gingival tissue covering the distal portion of the occlusal surface, only the mesial site was sealed. For the maxillary molars, therefore, two separate sites were recorded and analyzed.

Forty-six mandibular molars and fifty-four maxillary molars were sealed; the maxillary teeth consisted of fifty-four mesial sites and forty-six distal sites. Self-polymerized fissure sealant (Delton*AS) was applied after the surface was cleaned with a slurry of pumice and etched for twenty seconds; after polymerization of the sealants, the retention was tested by trying to pry the sealant off with an explorer.[8] Cotton-roll isolation was used and the sealant was applied according to the manufacturer's instructions.

The sealants were evaluated at baseline and after six months, twelve months, and three years; when rechecked, the teeth were rinsed, air-dried and examined with an explorer to detect the degree of retention of the sealants, and recorded as total retention, partial loss, or total loss. Sealant failure was defined as a partial or total loss of the sealant, and total retention when the material was fully retained and covered all fissures of the occlusal surfaces, including the palatal fissure when present.

RESULTS

From the original hundred molars that were sealed, seventy-one teeth with 105 sites were available after

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three years. The findings are presented in the Table. Total retention rate was 91 percent; only nine sealants out of the 105 sites were considered as failures. In thirty-one out of thirty-four mandibular molars available, the sealant was fully retained. The three failures were recorded as total loss in one and partial loss in the other two. In the maxillary teeth, all four distal sites graded as failures were decayed and replaced by occlusopalatal amalgam fillings. The other thirty sealants (88 percent) applied to the distal sites were totally retained. Complete retention rate for the mesial sites was 95 percent; in two sites the sealant was partially lost in one case and decayed in the other.

Table ☐ Degree of sealant retention by tooth-site after three years, using twenty seconds etching time.

First molars	Sealed tooth	Total retention		Failure	
Maxillary	No.	No.	%	No.	%
Mesial site	37	35	95	2	5
Distal site	34	30	88	4	12
Mandibular	34	31	91	3	9
Total	105	96	91	9	9

DISCUSSION

The three-year follow-up demonstrated that the retention rates of fissure sealants using twenty seconds etching time were comparable to those obtained, when the conventional sixty seconds etching was used. One study showed 100 percent retention after two years, when a filled sealant was used, following twenty-second etching time; in another clinical study, 99 percent of sealants were fully retained after one year.[6,7] Similar retention rates were reported after three years, when Delton was applied after sixty seconds etching time.[8,9]

The question arises whether there is a difference in the degree of marginal microleakage, when twenty seconds of etching are used; two recent studies reported that no difference in marginal leakage was found, when fifteen or twenty seconds of acid-conditioning was compared to sixty seconds.[5,10]

It would be obviously advantageous to reduce significantly the time used for enamel conditioning. This is especially true when maintaining a dry field in young children, when the rubber dam is not used.

CONCLUSION

Based on the findings of this study, it was concluded that the retention rates of fissure sealants using twenty seconds etching time were comparable to those obtained in previous studies, when the conventional sixty seconds were used. Considerable time and effort can be saved by reducing the etching time to twenty seconds.

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Physical restraint, informed consent and the child patient

Behavior

Alan Klein, DDS, JD

Today, dentists need not be reminded of the litigiousness of our society. This fact is readily apparent in the escalating cost of our malpractice insurance premiums. Of course, the primary prevention against malpractice is to practice good dentistry, but sometimes that is not enough. The dentist should also try to forestall a claim by taking preventive steps. This essay will describe steps that the dentist should take, when using physical restraint to modify the behavior of the uncooperative child patient, to allow treatment.

Consent is needed in order to treat a patient. When an adult who has previously received dental treatment presents to your office for treatment, that adult has given implied consent for regular dental care. Regular dental care means those procedures that are routinely used in dentistry, such as use of a handpiece, use of local anesthetics, use of silver fillings, etc. These are procedures that the average, reasonable person should expect, when visiting a dentist for treatment. When extraordinary procedures are to be used, the dentist should make sure that the patient expressly consents. Extraordinary procedures include the use of premedicating agents, the use of nitrous oxide sedation, the use of physical restraints, etc.

When a parent presents a child to your office for treatment, you have that parent's implied consent to provide regular dental care. But because a parent would not normally be familiar with physical restraining de-

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vices, you should obtain the parent's express informed consent, before their use.

Informed consent means that the dentist has explained the nature and purpose of the restraining device to be used, the risks and consequences thereof, the availability of alternative treatments, the consequences of foregoing treatment, and the prognosis of the proffered treatments. Information should be given to the parent so as to allow the parent to make a rational decision. Actual consent must be given and it should be unequivocal. If there is any indecision by the parent, it is best not to perform the procedure. Do not presume that silence of the parent equals consent.

Many offices have the parent sign a blanket consent form. They usually read somewhat as follows:
"I give permission to the dentist to perform all necessary treatment for my child, which the dentist deems to be necessary."

These consent forms provide little protection to the dentist in a court of law, because they are too general and all-inclusive. The court assumes that no rational person would ever give such a blanket consent; such a consent form would be rendered inadmissible, therefore, or would be given very little weight. A general consent form more valuable to protect the dentist should be explicit and specific for procedures that are routinely used in that office. For instance, the following general consent form would provide a better legal defense for the dentist:
"I give permission for the dentist to perform all necessary procedures to render treatment for my child. I realize that the practice of dentistry is different for children and that procedures may be used with which I may not be familiar. Some of the procedures that may be used with my child are (1) the use of physical restraints, (2) the use of nitrous oxide analgesia, and (3) the use of premedicating agents. The dentist has explained the nature of these procedures and I agree to their use for my child."

The above is only a general consent form and it should be signed by the parent upon initial presentation of the child for treatment. The major purpose of this form is to prevent problems; reading the form may raise questions that the parent may have about some of the procedures. Discussion before their use helps to prevent misunderstandings. Another purpose of this general consent form is to try to shift the burden to the parent, should the parent later claim consent was not given. Some courts will regard the signing of such a form by the parent as a presumption that consent has been given and the burden is then shifted to the parent to prove otherwise. But other courts may disregard such a general consent form and still place the burden of proof of having received proper informed consent upon the dentist. Nevertheless, it is a good preventive idea to use a well-written general consent form.

If the dentist decides that physical restraint will be necessary, obtain specific informed consent beforehand. Tell the parent about the need for physical restraint. Explain its use. Give reasons, alternatives, consequences. (This conversation should take place in the presence of a member of your staff.) Then ask the parent, whether consent to such a procedure is given. If consent is given, and it usually is, note so in the record. You can have the parent sign by the notation in the record. Have the staff member who witnessed the conversation sign the record.

Next, have the parent sign a separate special consent form that especially describes the use of physical restraint. This consent form should be self-explanatory and specific for the type of restraining device you intend to use. A picture of the device can be on the form. The form should be clearly labelled as a "Consent for the Use of Physical Restraint."

If the above procedures are followed, the dentist should have a strong defense that informed consent was received. The parent will have signed two written consents: one general consent and one specific consent. Also, the oral consent given by the parent will have been witnessed by a staff member. Obtaining all three types of informed consent should provide a strong defense in court for the dentist.

One should remember that if the parent has any doubts about your recommended treatment or methods, do not continue. Realize that it may be best for the patient to receive care elsewhere.

Death following oral sedation

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An alarming title, for it refers to the tragic death of a young child in a dentist's office, following oral sedation for an elective procedure. The case described is fictional; it bears striking similarities, however, to occurrences which have been described with heresay information in various parts of the country. Unfortunately, many cases go unreported and facts are difficult to corroborate. This case is described to illustrate lessons that can be learned, to prevent similar occurrences in the future.

CASE REPORT

A two-year-old, healthy, white male presented for treatment of extensive caries. In order to manage the child during treatment, the dentist decided to use chloral hydrate and hydroxyzine, oral sedatives. Because of extremely poor behavior during the examination, the dentist elected to use a "heavy dose", a customary procedure in that office for such behavior. Fifteen hundred milligrams of chloral hydrate together with twenty-five milligrams of hydroxyzine were administered orally. After a little coaxing by his mother, the patient drank the medication. As he had nothing to eat or drink for almost twelve hours, he did not cry during the administration; and after about twenty minutes fell asleep in his mother's arms. After forty-five minutes he was transferred to the operatory, where he was wrapped in a cloth restraint and administered 50 percent nitrous oxide/oxygen inhalation analgesia. One carpule of lidocaine local anesthetic (1.8 cc, 2 percent, 1:100,000 solution) was administered and was followed by placement of a mouth prop and a rubber dam. Although the patient was reasonably well-behaved during administration of the local anesthetic, he cried hysterically and attempted to move about during placement of the mouth prop and application of the rubber dam. After ten minutes, he quieted down and the dentist proceeded with treatment. Treatment consisted of placement of composite crowns on the maxillary four anterior teeth and a pulpotomy and stainless steel crown on the maxillary left first primary molar tooth. During treatment the dentist had difficulty fitting the crowns, because of the small teeth. Consequently, it was necessary for the assistant to leave the chairside, in order to obtain special crown forms from another room.

The dentist monitored the patient periodically by noting respirations characterized by a slight wheezing sound. Actual respiratory movements of the chest could not be observed, because of the body wrap; and color of the patient was not monitored, because oral tissues were covered with the rubber dam, hands were enclosed in the body wrap, and the feet were encased in shoes and socks.

Although there were instances during the first twenty-five minutes when the patient cried hysterically, he eventually fell asleep, allowing the dentist to complete all of the scheduled treatment in an hour. When

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treatment was completed, the dentist turned off the nitrous oxide, removed the rubber dam and the body restraint. The dentist then noticed the unusual pale color of the tissues and that the child was no longer breathing. With his ear pressed against the child's chest, he could detect only a faint heart beat.

Realizing the gravity of the situation, the dentist quickly carried the child to the office of the pediatrician located in an adjoining suite of offices. The pediatrician was not present, so the dentist attempted to administer external cardiac massage on the floor, followed by mouth-to-mouth resuscitation. Emergency medical services were called. Within ten minutes, the emergency services vehicle arrived and oxygen was administered to the patient. There was still no response, however, and when the patient arrived at the hospital a short time later, he was pronounced dead.

CASE ANALYSIS

The dentist in this case was considered by his patients and peers to be conscientious, and considerate. The procedures used with this patient were similar to those used whenever he sedated patients. Nevertheless, a tragedy resulted because of errors of omission and commission: specifically, an excessive dose of the sedating drug, inadequate monitoring of the patient, and inappropriate management of the emergency situation.

Dose

The manufacturer's recommended dose for chloral hydrate is 50 mg/kg of body weight. Many practitioners slightly exceed that dose, and there are some who use a fixed dose, according to the patient's age and behavior. In this case, the dentist did not weigh the patient and, because of extremely negative behavior, decided to use 1500 milligrams of chloral hydrate, supplemented with twenty-five milligrams of hydroxyzine, to augment the effect of the chloral hydrate. It was determined at the postmortem examination that the patient weighed twelve kilograms; thus, the dose of the chloral hydrate was 125 mg/kg. While the pathologist could not state that the patient died from a drug overdose, that possibility could not be ruled out, particularly because the chloral hydrate was supplemented with hydroxyzine and 50 percent nitrous oxide.

Methods of Monitoring

This patient was not continuously monitored throughout the operative procedure. After he stopped crying and fell asleep, neither the dentist nor the assistant was able to note the time that the patient stopped breathing. Because of concern by the operator and the assistant with the details of the dental procedures and the difficulty in monitoring the patient without a precordial stethoscope and without the ability to observe color changes in the tissues, this patient was not adequately monitored during the operative procedure. Guidelines for use of conscious sedation, such as those developed by the American Academy of Pediatric Dentistry, state that a patient should be monitored continuously during an operative procedure; and vital signs recorded periodically: heart rate, respiratory rate, and tissue color. Furthermore, the patient's head position should be closely monitored, to maintain a patent airway. This patient might not have had an adequate airway, resulting in respiratory insufficiency, respiratory depression, and cardiac arrest. With appropriate monitoring, the consequences could have been averted by suitable early intervention.

Emergency management

Even at the time that the dentist noted the lack of respiration, the tragedy might have been averted had the proper emergency procedures been instituted immediately. Rather than moving the patient to another location, the dentist should have begun positive pressure oxygen immediately, while awaiting arrival of assistance.

DISCUSSION

Steps can be taken to lessen the chances of accidental occurrences. Preparations can also be made to guard against the consequences of accidents, should they occur. Practitioners should not adopt a smug attitude because they have never encountered an emergency situation in their offices after years of practice. Years of practice without any problem will be no excuse for inappropriate or inadequate action, when an accident occurs. When sedation is used in the dental office, the guidelines of the American Academy of Pediatric Dentistry for the use of sedation in pediatric patients should be followed. Only those drugs and drug doses for which the practitioner has received training should be used. Patients should be monitored properly throughout the procedure and practitioners should be prepared for any emergency situation that might result.

Improving children's oral hygiene through parental involvement

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Many authors have suggested that children's dental health would be improved with parental involvement.[1-8] In an attempt to improve the dental health of children by involving parents in workshops, approaches such as phone calls, displays, parent-teacher conferences, films, newsletters, and dental health guides have been tried.[1,3,4] Others recommended that parents learn the skills for oral hygiene at the same time as the child.[5,7]

Sarnat *et al* found that children whose mothers had strongly positive attitudes about them had better oral hygiene and less caries.[9] He stated, however, that "the relation of attitude to behavior is not a straight forward cause and effect connection, but rather a more elusive relationship with various external (objective) and internal (subjective) factors playing a role in the process".

Rayner felt that the mother's dental practices are one of the most influential factors in determining her children's practices, in all socioeconomic groups.[10] In a later study she stated that "regardless of social class, education of mothers to provide a good example seems to be the key to changing children's dental health practices". She suggested that adults be educated to change behavior first rather than attitudes.[11]

At an instructional toothbrushing session, Lee studied the effect of parental presence on the dental health of kindergarten children.[6] He used a fourteen-week toothbrushing chart to show behavioral changes and found significant improvements in the dental health of these children.

Interesting work by Rayner showed that mother's health care practices related to her perception of her own social class.[11] She concluded that mother's attitudes toward dental health stem from the frequency with which her toothbrushing and dental visits occur. Rayner's theory is supported by research done earlier by Kriesburg and Bem.[12,13] They both felt that a person's attitudes are inferred from his own behavior. A person develops a belief system which is consistent with his behavior. Rayner supported this theory and said that "in the lower socio-economic group where there were few dental health practices, mother's attitudes toward dental health seemed non-existent".[11]

Blinkhorn investigated the transmission of toothbrushing behavior by mothers.[14] He believed that the mother's behavior is transmitted to children by means of the "primary socialization process" and that "patterns of behavior learned at an early age are deeply ingrained and resistant to change at a later time". Blinkhorn also

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felt that mothers teach the norms of the social class or group of which they perceive themselves a member, and that norms can be used to encourage the acquisition and maintenance of toothbrushing behavior. His study agrees with Rayner in that mothers were unfamiliar with toothbrushing patterns for their children. Blinkhorn felt this was due to lack of knowledge about such things as what age to begin brushing, whether or not to check oral cleanliness after toothbrushing, and reasons for toothbrushing. He suggested that health educators create new norms of toothbrushing behavior by giving specific advice to parents on how, when, how long, and how often children should brush.[14,15]

From the literature it can be concluded that children's dental health practices are influenced most by parental direction and guidance as well as parental dental health practices. In the literature it is also suggested that parents with positive dental health attitudes have children with healthy dentitions. It has been pointed out, however, that parental attitudes are inferred from their behavior, that is, healthy mouths lead to positive dental attitudes. If children are expected to behave in a positive manner, health educators must convince parents that they must set the example by behaving in a similar manner. This kind of parental motivation should be accompanied by some attempt to teach the norms of toothbrushing behavior in regard to how, when, how often, and why children should brush their teeth.

The purpose of this study is to evaluate whether preschool children's oral hygiene would improve if parents, after receiving professional instruction, could demonstrate the techniques of proficient toothbrushing.

METHODS AND MATERIALS

All subjects were new or recall patients at the Pediatric Dental Clinic of the Medical College of Virginia School of Dentistry, and the Harris Dental Clinic of Richmond, Virginia. Subjects included fifty preschool children, ages three to five years, and their parents. In addition to age requirements, subjects were free of serious medical or physical handicaps, such as mental retardation, cerebral palsy, organic heart disease, or blood dyscrasia.

Personal and demographic information acquired from parents provided data for computation of Hollingshead's two-factor index of social position, an index based on occupation and education.[16] This was done to assess any socioeconomic differences between the parents at the two locations, Medical College of Virginia Dental School or Harris Dental Clinic.

A comparison between new and recall patients was made to determine the effect of previous dental visits on baseline plaque and gingival scores. Each subject was separated from his or her parent (father or mother) and brought into the dental operatory. Examiner number 1 obtained a gingival index using criteria established by Loe and a plaque index using criteria established by Green and Vermillion (Chart).[17,18] In order to facilitate the collection of data and accommodate the primary dentition, both indices were modified by including only four primary teeth: the primary maxillary right second molar, the primary maxillary left central incisor, the primary mandibular left second molar, and the primary mandibular right central incisor. In the absence of one of these teeth, an adjacent first molar or central incisor was used. The validity of using this modification in the primary dentition was established by using a statistical comparison of the original (twenty teeth) and modified (four teeth) forms of the gingival index and plaque index on twelve patients. The paired T-test showed the difference between both indices not to be significant.

After both the gingival and plaque indices were recorded, the patients were randomly assigned to either a control or an experimental group. There were twenty-six subjects in the control group and twenty-four subjects in the experimental group. In both groups, the parents were brought into the operatory with the child. All parents were shown a proper toothbrushing technique, that is, scrub method, as well as how, when and why toothbrushing should be performed.[19] Instruction on positioning the child to accomplish the brushing best was also given. The child stood in front of and faced away from the seated parent and leaned back. The parent used the left arm to cradle the child's head, leaving the right hand free to brush. The fingers of the parents left hand were used to retract the child's lips, to allow adequate visualization and access to posterior teeth.[19]

In the control group, parents were only allowed to observe and ask questions. This is different from the experimental group, where parents were asked to complete the brushing of the second half of the child's mouth (right or left), while the examiner continued to explain correct brushing technique. After the examiner felt the parent had demonstrated proficiency in brushing and an adequate degree of correct brushing knowledge, both parent and child were dismissed. All patients were given a four-week follow-up appointment.

On follow-up, examiner number 2 or number 3, obtained a modified gingival index and modified plaque index (Chart). This was done before any cleaning or restorative procedures. A prophylaxis and fluoride treatment concluded the follow-up visit.

A. Modified Gingival Index*: (0, 1, 2, 3)

0 = Normal gingiva.
1 = Mild inflammation—slight change in color, slight edema.
2 = Moderate inflammation—redness, edema and glazing.
3 = Severe inflammation—marked redness, edema, and ulceration.

*Scores were made by visual examination only.

B. Modified Plaque Index**: (0, 1, 2, 3)

0 = No debris or stain present.
2 = Soft debris covering not more than one third of the tooth surface.
2 = Soft debris covering more than one third, but not more than two thirds of the exposed tooth surface.
3 = Soft debris covering more than two thirds of the tooth surface.

**Scores were made following staining of the plaque with disclosing solution.

RESULTS

Results from Hollingshead's two-factor index of social position showed the Harris Clinic population to have a lower, but not significantly so, socioeconomic position than the Medical College of Virginia population. This similarity allowed for the combined evaluation of all patients from both locations.

An evaluation of interrater reliability showed a 91 percent agreement between examiners number 1 and number 2, 94 percent agreement between examiners number 1 and number 3, and 91 percent agreement between examiners number 2 and number 3.

Control and experimental patients were assigned to one of two groups, *new* and *recall* (Table). New patient's plaque scores in the experimental group improved significantly ($p<.05$) from baseline to follow-up. Recall patients in this same experimental group showed moderate, but not significant, improvement. In the control group, there was not significant improvement in plaque scores for either new or recall patients. An evaluation of the total patients (both new and recall) showed significant improvement from baseline to follow-up in the plaque index (PI) of the experimental group ($p<.05$), but not in the control group. There was no significance in the gingival index (GI) scores for either the experimental or control groups.

DISCUSSION

Previous research provided support for predicting the outcome of this study.[1,3,7,8,13-15,18] It is difficult from our results to predict any long-term effects, beyond the four-week period. Monitoring of oral hygiene should continue, therefore, with reinforcement of home care for both the child and parent on a routine basis.

Improved plaque scores accompanied by little or no improvement in gingival scores could indicate an effort by the parents to brush their child's teeth before a dental visit. This in itself could be viewed as heightened awareness, but would not effect a reduction in caries incidence.

A significant improvement in plaque scores of new patients as opposed to recall patients in the experimental group was an expected observation. It was hypothesized that new patients would have higher plaque scores than recall patients, at the initial visit. If there was an equal reduction of plaque for both new and recall

Table ☐ Mean gingival (GI) and plaque (PI) scores (using student T test).

	Experimental								
		Baseline scores		Followup scores		*Change scores		Significant scores	
	N	GI	PI	GI	PI	GI	PI	GI	PI
New patients	12	.42	1.45	.43	1.11	−.01	+.34	N.S.	p<.05
Recall patients	12	.58	1.63	.63	1.37	−.05	+.26	N.S.	N.S.
Total patients	24	.50	1.55	.51	1.24	−.03	+.31	N.S.	p<.05
	Control								
		Baseline scores		Followup scores		*Change scores		Significant scores	
	N	GI	PI	GI	PI	GI	PI	GI	PI
New patients	16	.44	1.41	.42	1.39	+.02	+.02	N.S.	N.S.
Recall patients	10	.63	1.58	.64	1.60	−.01	−.02	N.S.	N.S.
Total patients	26	.51	1.52	.52	1.53	−.01	−.01	N.S.	N.S.

*a positive value indicates an improvement in gingival or plaque scores.

patients in the experimental group, at the follow-up visit, significant results should be seen for the new patients. The recall patients in both the experimental and control groups, however, had higher gingival and plaque baseline scores than new patients. This was not expected (Table). Perhaps recall patients in this study simply did not take oral hygiene and toothbrushing instruction as seriously as new patients.

Parents can and should be utilized in establishing good oral hygiene and home care practices in their children. Especially in the preschool ages where many children simply lack the ability, desire or understanding to brush their own teeth adequately. It is felt that a "hands on experience" and clinical instruction will have a more lasting effect on the parents to continue to brush and monitor their child's teeth regularly. It should also reinforce recognition of the need for good oral hygiene.

Parental involvement seems to be a key element in the area of preventive dentistry for children. Although added time and effort are required, both parents and children seem to enjoy the added attention, which can improve dentist-patient relationships as well as plaque scores, in the preschool population.

CONCLUSION

The findings of this study indicate that parental proficiency in toothbrushing is helpful in improving the plaque scores of preschool children. This is significant, however, only in new and not recall patients.

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PREVENTABLE CAUSES OF INFANT MORTALITY

A congenital defect was listed as a cause of death in 21.3% of all infant deaths; low birth weight was listed in 42.9% of these deaths. The contribution of low birth weight was greatest in the perinatal period and declined rapidly thereafter. The contribution of congenital defects was greatest in the neonatal period. (Fig 1). Infectious diseases contributed to infant deaths in both the neonatal and postnatal periods. The largest number of infectious disease-related deaths occurred in the 11-month postneonatal period (n = 2.716). Among low birth weight infants who died, 7% had a congenital defect and 9% had an infectious disease.

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Effect of dental drawings and coloring on attitudes of child patients

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Generally speaking, children who visit the dental clinic for the first time show less anxiety than expected. Their behavior in the reception room and in the examination-treatment room is acceptable, while accompanied by their mothers. When asked to sit in the dental chair, however, they become apprehensive. Some refuse even the simplest treatments such as fluoride and sealants. Separation from their mothers, and unfamiliarity with members of the dental staff, and the instrumentation associated with treatment are causative factors of their anxiety.

To diminish anxiety or fear, it is necessary that children become accustomed to the environment of the dental office and develop feelings of trust and confidence in the dental staff. They should be informed, furthermore, about treatment procedures. Procedures used to accomplish these recommendations are, among others, tell-show-do and hand-over- mouth.[1-3]

When tell-show-do is used, children should be encouraged to talk with the staff and to handle instruments freely. In our clinic, the results were not good, however, particularly for children who could not yet talk sufficiently. So, we attempted to talk with them through picture books. We succeeded in interesting the children in the books, but they failed, nevertheless, to develop positive attitudes toward examination and treatment.

We experimented with a new method, *Dental drawings and coloring*. We prepared drawings of several anticipated dental procedures. In these drawings, details of the dental procedures are depicted and instruments are drawn to an oversize scale. A staff member shows a drawing to the patient and explains the treatment he will receive; then, he asks the child to color the drawing. After the coloring is completed, details of the planned treatment are again carefully explained. Then, treatment is administered unhurriedly.

The aim of this study is to test the efficacy of this method in alleviating the anxiety or fear of child patients.

METHOD

Materials and options

The procedure was accomplished in six steps, for which appropriate drawings were prepared (Figure 1). The number of steps to which a child was subjected was in accordance with the child's treatment needs. Descriptions of the six steps follow:

- ☐ Initial appointment: Drawing 1 - Toothbrushing. In this step, the child is asked to color the drawing with the help of a dental hygienist. Then the child's mother brushes his teeth. Efforts are made to accustom him to the atmosphere of the clinic. The reception and the examination-treatment rooms of

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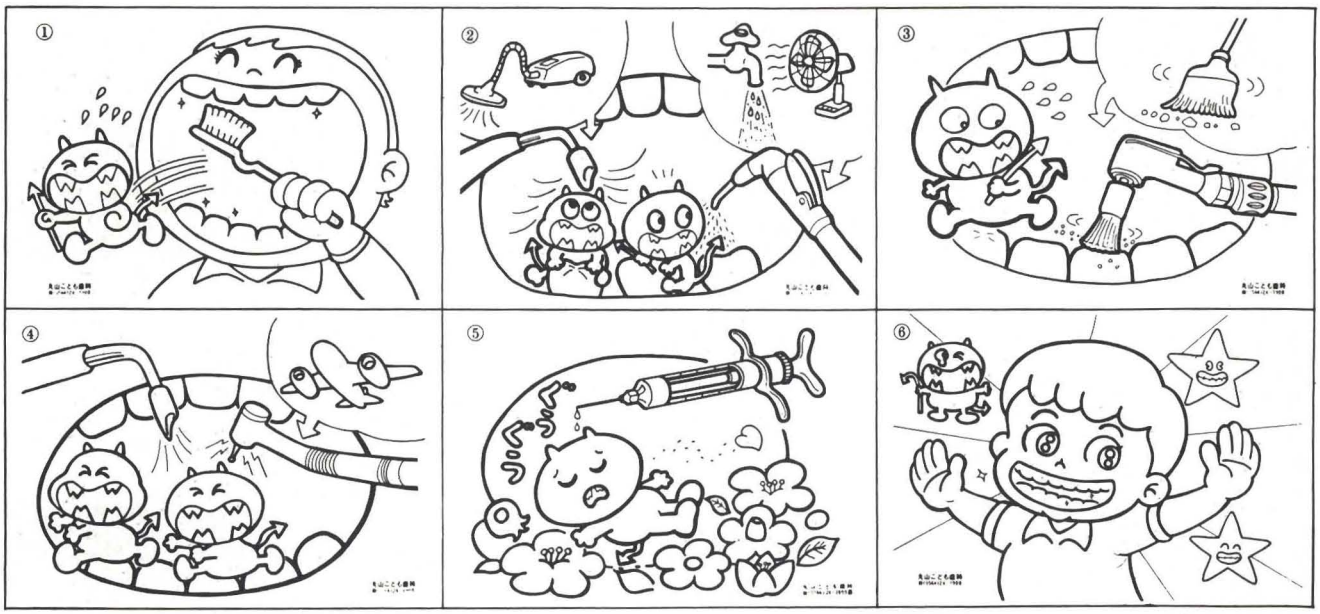

Figure 1. Dental Drawings used in conjunction with the six steps of examination and treatment: 1 Tooth brushing, 2 Washing the mouth with vacuum and three-way-syringe, 3 Cleaning the teeth with brush in handpiece, 4 Drilling a vital tooth with air turbine, 5 Infiltration anesthesia by injection, and 6 Motivating the patient toward oral health.

our clinic are designed and decorated (with colored drawings, paper-folded figures, etc.) to please children.

- ☐ Primary preventive treatment (fluoride application): Drawing 2 - Washing the mouth with vacuum and three-way-syringe. The purpose is to acquaint the child with preventive measures, and to accustom him to the vacuum and the syringe.
- ☐ Secondary preventive procedure (sealants application): Drawing 3 - Cleaning the teeth with brush in handpiece, to accustom the child to the low-speed handpiece.
- ☐ The cavity preparation (treatment of minor dental caries): Drawing 4 - Drilling the vital tooth, using the air turbine. The aim is to enable the child to cope with some unpleasantness and pain.
- ☐ Local anaesthesia (treatment of deep dental caries): Drawing 5 - Infiltration anaesthesia, to reduce the child's fear of injection.
- ☐ Final appointment: Drawing 6 - Motivating oral healthcare by praising the child for his clean teeth, and encouraging him to practice oral healthcare at home.

The staff use the drawings to maintain good communication with the patients and to reinforce their understanding of dental procedures. For example, a staff member may ask "Which instrument is used for cleaning your teeth?", and the child is expected to point to an appropriate instrument.

After the examination and treatment at each step are completed, the child is given a drawing for the next step, and asked to color it for his next visit. It is the child's homework as well as his gift. When the child returns, he is praised for his completed drawing, and encouraged to accept examination and treatment.

The mother is usually given a simple explanation of the homework, and asked only to watch while her child colors the drawing. She is also told that no member of the family should say anything that might cause him anxiety. It is essential to have the mother's cooperation.

OBSERVATIONS

Attitudes for all six treatment steps were assessed, but only those for two steps will be noted here, because they concern the results to be reported later.

First, the child's attitudes toward separation-from-mother and toward the three-way-syringe were evaluated. If he entered the examination-treatment room alone to receive treatment, only with guidance from a staff member, his attitude was recorded as independent (A1). If he did not reject the syringe, it was recorded acceptance (B1). Second, in relation to cavity preparation, his attitude toward the air-turbine was evaluated. If he did not refuse the air-turbine, his attitude was recorded acceptance (C1). The evaluations for B1 and C1

were recorded, regardless of his mother's presence. To assure objectivity, the evaluations were conducted by one dentist and three staff members, independently, and then averaged.

Patients observed

The study population consisted of 362 children who received all of the required treatment and returned for their periodical check-ups approximately three months later. Their ages ranged from two to four years. The children were assigned randomly to one of two groups: 207 to the Dental-Drawings-and-Coloring group (107 received preventive treatment; 100, cavity preparation); and the remaining 155 were assigned to the control group (seventy-four received preventive treatment; eighty-one, cavity preparation).

RESULTS

Results are summarized in Figure 2. Relative frequencies of all two-to-four-year-old patients who were marked A1 evaluation (independence from their mothers) were 57 percent of 107 patients in the Dental- Drawing-and-Coloring group, and 30 percent of seventy-four patients in the control group, as shown in the upper graph of Figure 2. The difference between the two groups was statistically significant ($P < 0.20$ for two-year-olds, $P < 0.001$ for three-year-olds, and $P < 0.001$ with X^2-test). Furthermore, the differences at all age- levels were similar. Specifically, however, the differences were $P < 0.20$ for two-year-olds, $P < 0.001$ for three-year-olds, and $P < 0.30$ for four-year-olds. It may be concluded, therefore, that the Dental-Drawings-and-Coloring program had a marked effect on the attitudes of three-year-olds, particularly.

The B1 evaluation (acceptance of the syringe) for all two-to-four-year-olds was 75 percent in the "drawings" preventive treatment group, and 64 percent in the control group (middle graph of Figure 2). X^2-test showed that the difference between the groups was significant at the level of $P < 0.10$. Concerning the difference at each age level, statistical significance was found at $P < 0.05$ for three-year-olds, and $P < 0.70$ for four-year-olds. For two-year-olds the relationship between the groups was reversed, though the difference was slight. Again it should be pointed out that the drawing and coloring exercises had marked effects on the attitudes toward the syringe, particularly in the case of three-year-old patients.

The percentage of the C1 evaluation (acceptance for the turbine) for all two-to-four-year-old patients was 65

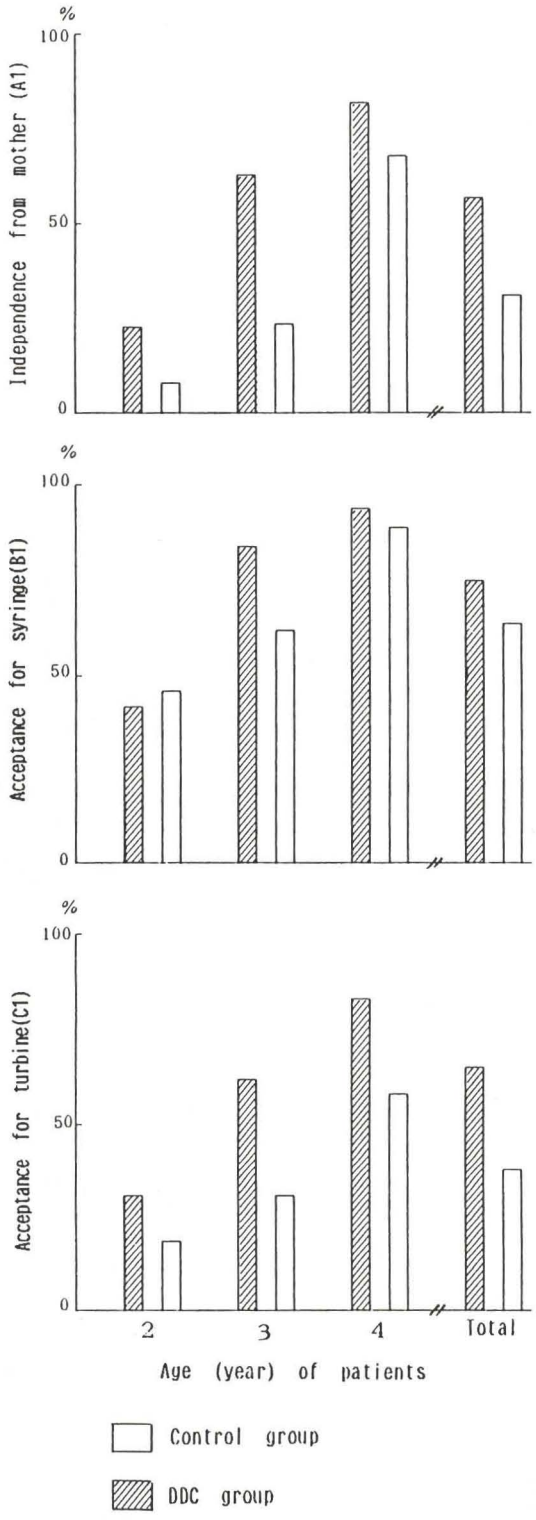

Figure 2. Relative frequencies of observed attitudes of child patients in relation to their chronological ages.

percent of 100 patients in the drawing and coloring and cavity preparation group, and 38 percent of 81 patients in the control group as shown in Figure 2. The difference between them was highly significant ($P < 0.001$). Signifi-

cant statistical differences between age-groups were $P < 0.50$ for two-year-olds, $P < 0.01$ for three-year-olds, and $P < 0.05$ for four-year-olds. Again a marked effect of the drawing and coloring exercise was found in three-year-olds and in four-year-olds.

DISCUSSION

The results indicate that the use of *Dental Drawings and Coloring* brought about marked changes in attitude of the patients during examination and treatment. Following are discussions on the three categories of the study:

Independence from mother

In the evaluation of the two-to-four-year-old children, concerning independence from their mothers, there were 27 percent more children in the drawing-and-coloring group who were rated as "independent of their mothers" than in the control group. Specifically, they entered the examination room without their mothers. It was observed, however, that many two-year-olds in the drawing-and-coloring group, as well as in the control group, could not act independently for the dental examination. In contrast, 63 percent of the three-year-olds in the drawing-and- coloring group were able to act independently; but only 24 percent in the control group. In the four-year-old group, the number of those who could act independently increased in both groups (experimental and control).

Attitude toward the syringe

Many children in both the drawing-and-coloring and control groups adapted to the syringe fairly rapidly. Over 50 percent of the two- year-olds, however, showed signs of rejection of the syringe. For example, many of them placed their hands over their mouths, and finally began to cry, when the dentist tried to insert the syringe. Among the three-year-olds there was only a slight difference between the two groups, in terms of acceptance of the syringe. In four-year-olds, approximately 90 percent of the children in both groups showed no inclination to reject the syringe, evidence that four-year-old children do not require special help in learning to accept the syringe.

Attitude toward the turbine

The drawing-and-coloring exercise proved effective in reducing fear of the turbine; the relative frequency for three-year-olds in the drawing-and-coloring group was 62 percent, but only 31 percent in the control group (see the bottom graph in Figure 2). A similar tendency exists among the four-year-olds. We were surprised that such high percentage of children, three- and four-years of age, would endure the noise, the water, and the pain associated with the instrument. Most of the two-year-olds, however, often cried and moved their heads and legs uncontrollably. Their levels of mental development do not permit comprehension of the situation.

These results suggest that it is important and useful to inform child patients about the use of instruments that may cause negative or antagonistic reactions. Information through good communication helps children not only to overcome their anxiety and fear of dental treatment, but to develop their trust and reliance in the dental staff. The use of the Dental-Drawings-and-Coloring exercise should prove useful.

The authors express appreciation to Dr. Tsuneo Tomita, Professor emeritus of the Medical School of Keio University in Japan, and also of Yale University in USA, for his kind guidance and continuing encouragement.

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The suicidal adolescent

Suicide

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Suicide is a major cause of death among young people, surpassed only by homicide and accidents.[1] The degree to which health professionals are addressing this phenomenon appears to be minimal, partly under the mistaken impression that adolescents do not become depressed and hence, are unlikely to commit suicide.

To help decrease the rate of suicide, society and members of the health professions must be educated about the precipitating factors of suicide, common presuicidal behavior, and methods for the prevention and intervention of suicide. Only in recent years has educational material been obtainable from television, radio and literary sources. These educational efforts appear to have had a minimal impact, since the rate of suicide continues to increase at an alarming rate.[1-3]

To date, no articles on adolescent suicide have been published in the dental literature. Dentists have a responsibility for the overall health and well-being of their patients. Since dentists and their support staffs frequently interact with patients on a personal level, it

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would not be uncommon for them to notice progressive changes in behavior possibly indicative of suicidal intention. The ability to recognize warning signs and the willingness to take action could make the difference between life and death.

The intent of this paper is to inform the dental profession about the trend, predisposing factors, warning signs, and methods for the intervention of suicide.

HISTORY

It is widely believed that the number of reported suicides underrepresents the actual number. In the absence of evidence of intentional death, such as a note or witness, suicide may not be discerned as the actual cause of death. Even when suicide is the cause of death, the family may conceal it, because of feelings of shame or guilt. Nevertheless, statistics still reveal a distressing trend. Once regarded as an extremely rare occurrence among adolescents, suicide is becoming an increasingly major concern to society.

Table 1 summarizes the male suicide rate from 1950 to 1979 in three age-groups. Over the first twenty-five years, the rates tripled for males between the ages ten to fourteen years and twenty to twenty- four years and quadrupled for males between the ages fifteen to nineteen years. During 1978 and 1979, the trend appears to have receded slightly among all three age-categories. The suicide rate has progressively increased, however, from 1979 to 1986.[3]

Table 2 summarizes the female suicide rates in the same age-groups, over the same time-period. From 1950 to 1979, the rate increased five times for females ten to fourteen years of age and doubled for the other two age-groups. In absolute numbers, the male suicide rate is four times greater than the female suicide rate. For both sexes, the highest rate was in the twenty-to-twenty-four-year age-group.

A remarkable difference exists among ethnic groups.[1,2] Among nonwhite males between fifteen and nineteen years of age, suicide rates are approximately half those for white males. Interestingly, no differences exist between nonwhite males and white males between twenty to twenty-four years of age.

Table 1 ☐ Male suicide rates in the United States per 100,000.[1,2]

	Age-Group (years)		
Year	10-14	15-19	20-24
1950	0.5	3.5	9.3
1960	0.9	5.6	11.5
1970	0.9	8.8	19.3
1975	1.2	12.0	25.9
1977	1.6	14.0	29.2
1978	1.2	12.6	26.8
1979	1.1	13.4	26.5

Table 2 ☐ Female suicide rates in the United States per 100,000.[1,2]

	Age-Group (years)		
Year	10-14	15-19	20-24
1950	0.1	1.8	3.3
1960	0.2	1.6	2.9
1970	0.3	2.9	5.7
1975	0.4	2.9	6.7
1977	0.3	3.3	7.1
1978	0.4	3.0	6.3
1979	0.5	3.2	6.3

CONTRIBUTING FACTORS

There are many predisposing conditions implicated in suicidal ideation, in the adolescent. Competition, greater pressure for success, feelings of personal ineffectiveness in the face of an increasingly complex social environment, inability to cope with greater independence offered at a younger age, lack of adults and institutions worthy of trust and admiration are common causes of suicide among the young.[4] These may involve loss of love, security, ambition, image or hope to the adolescent.

Family problems can have an influence on adolescent suicidal behavior. Lack of communication between parents and adolescent can leave the adolescent feeling isolated and unloved. Several studies have shown that suicidal adolescents experience more family problems than nonsuicidal adolescents.[5-7] Many suicidal adolescents did not live with their parents, indicating disruptive family lives. Hart and Keidel found that families of suicidal adolescents often were extremely involved in some major crisis, in which the adolescent was a participant, but not the center of the crisis.[7] This may have placed extra pressures on the adolescent, thus disallowing fulfillment of his own needs.

Divorce or separation of the parents has also been found in many cases of suicide among adolescents.[6] Loss of parents by divorce, death or suicide can disrupt the family, leaving the adolescent feeling rejected and unloved. Green reported that children who were physically abused were more likely to exhibit self-destructive behavior than children who were not physically abused.[8]

Depression in the young person has also been linked to suicidal behavior.[6] Depression is characterized by

physiological and emotional symptoms such as sleep disturbances, weight change, feelings of sadness and emptiness, and loss of interest in school and social life.[4,6]

A dentist should suspect suicidal behavior in adolescents who express one or more of the above causative influences. It is important to realize that there is no single cause of suicidal behavior, since it is usually the result of a progression of several problems.

WARNING SIGNS

An adolescent contemplating suicide often exhibits identifying warning signs. It is through these changes in behavior that dentists may recognize their intent. A dentist's awareness of a patient's suicidal tendencies is probably surprisingly low, however, as it is with other health professionals, such as pediatricians.[9] Examples of presuicidal behavior include changes in eating and sleeping habits, trouble with school work, disinterest in friends and activities, anxiety, violent or rebellious behavior, drug or alcohol abuse, unusual neglect of personal appearance, tendency to be uncommunicative and a sense of hopelessness.[4,5] Patients who have an erratic appointment record may also be reacting to emotional problems.

Adolescents also at risk for suicide are those who have previously attempted suicide. Four out of five persons who commit suicide have made at least one previous attempt.[5] A common misconception is the belief that teenagers who have attempted suicide are just looking for attention and that they will not try again. If the problems that led them to seek this attention are not resolved, however, the adolescent may make another attempt, which may result in death.

A sudden, unexplained improvement in depression may also be regarded as a danger sign of suicidal intent. Adolescents who have committed themselves to suicide will express a relief from the stress and confusion, which they have been feeling. It is not uncommon for presuicidal adolescents to make final arrangements with the family and close friends. Their behavior is often unrestrained, in which their inner most feelings are expressed and gifts are made of their prized personal possessions.

There is a common misconception that when someone threatens to commit suicide he will not actually go through with it. Before committing suicide, people often make direct statements about their intention to end their lives, or less direct comments about how they might as well be dead or that their friends and family would be better off without them. Whether warning signs are direct or indirect, they are indicative of presuicidal behavior and should, therefore, be taken seriously.

It is important to keep an open mind, when observing and questioning changes in a patient's behavior. A dentist should be particularly concerned, if their patient expresses any one of the following warning signs of suicide:

- ☐ Suicidal threats.
- ☐ Statements revealing a desire to die.
- ☐ Previous suicidal attempts.
- ☐ Sudden changes in behavior (withdrawal, apathy, moodiness).
- ☐ Depression (crying, sleeplessness, loss of appetite, hopelessness).
- ☐ Final arrangements (disposal of prized possessions).

METHODS OF INTERVENTION

In all suspected cases, a history should be obtained from both the parents and adolescent. Valuable information may also be obtained from other involved individuals, such as a school teacher. Immediate intervention is a necessity, for waiting may only confirm your suspicions.

It is important to establish a good patient-dentist relationship before asking any questions. It has been reported that patients are more willing to discuss their feelings with their doctor, when the doctor communicates in a less directive style, that is, by using open-ended rather than close-ended questions.[10] For example, asking "what's on your mind today" as opposed to "is your tooth bothering you today." Evidence suggests that patients, in responding to open-ended questions, express more satisfaction, demonstrate more participation, and comply better with their treatment.

If the patient shows warning signs, then the dentist may pursue his suspicions by asking questions such as: Is there something bothering you? Are you feeling depressed? Have you thought about suicide? Have you tried to injure yourself or commit suicide? Open discussion, in itself, will not provoke a youngster's suicidal action.[7] It will show him that someone actually cares.

The dentist should avoid making judgments or act shocked, as this may cause the adolescent to lose confidence in him. It is not recommended to offer advice such as: Think about how much better off you are than most people. You should appreciate how lucky you are. These comments may increase the adolescent's feelings of guilt and worthlessness.

If an adolescent confirms his suicidal ideation to the

dentist, strong recommendations to seek professional counseling should be made to the adolescent and his parents. It is important to take the initiative by making suggestions and even offering to arrange an appointment. The American Association of Suicidology* reports that there are approximately 200 Suicide Prevention Centers in the United States and just as many twenty-four-hour hotlines. If these are not available, then the dentist should recommend a psychologist or psychiatrist, a mental health clinic, or the family physician. The dentist must not rely on the patient to follow his advice. He should always determine whether the patient has been seen by the consultant.

If the suicidal adolescent refuses to seek professional care, which may actually be the decision of his parents, the dentist is obligated to take appropriate action. The primary objective is to stop the adolescent from harming himself and to see that he receives adequate medical attention. A breach of confidence in this instance is in the patient's best interest. Professionals answering a suicide hotline or at a prevention center will be helpful in providing the dentist with steps to take, if assistance were to be refused.

In summary, when suicide is suspected, a dentist should:

- ☐ Discuss the matter openly and frankly with the adolescent and his parents.
- ☐ Express interest and support.
- ☐ Ensure adequate medical intervention.

SUMMARY

It is the author's opinion that by educating dentists on the warning signs of suicide and the protocol for managing suspected cases, the tragic deaths of many adolescents may be prevented. Educational material should be presented in the undergraduate dental curriculum and periodically reenforced in the dental literature and continuing education courses.

Dentists and their staffs must be constantly alert to warning signs of this ever-increasing problem. Suspected cases should be thoroughly investigated and followed up.

*American Association of Suicidology, 2459 South Ash Street, Denver, CO 80222.

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SUICIDE

Unconsummated attempts at suicide can strike the rest of us as self-pitying, self-aggrandizing, or as plaintive plea-bargaining—"childish," we say, though actually the helplessness that echoes through a child's suicide is ghastly beyond any stunt of self-mutilation an adult may indulge in. It would be hard to define chaos better than as a world where children decide that they don't want to live.

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Case reports

Prevalence of mesiodens in a pediatric Hispanic population

Laura Castillo Kaler, DDS

Mesiodens are supernumerary teeth in the region of the maxillary central incisors, a condition which can lead to disorders of the dentition.[1-5] Research has been published concerning the incidence of mesiodens in the general population, as well as in certain ethnic or racial groups, including Scandinavians and Mongoloids. A recent study undertaken by this author introduced the possibility of an increased rate of mesiodens among Hispanic children.[6] With its limited scope, that survey suggested the possibility of a prevalence rate of mesiodens in Hispanic children more than twice that in Caucasians.

In 1980, the U.S. Census Bureau indicated that there were over fourteen million persons of Hispanic origin in the United States.[7] They are the fastest growing minority group in the country.[8] The Southwest in particular has a high density of Hispanic individuals. In Dallas, where this research was conducted, the Hispanic population was 12 percent of the total population in 1980, and is growing steadily.[7]

As a follow-up to this preliminary investigation of the rate of occurrence of mesiodens in Hispanic children, this present study was undertaken, using a larger and entirely Hispanic population, to compare the incidence of mesiodens in the Hispanic group with that in other racial groups.

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MATERIALS AND METHODS

This study was conducted retrospectively of 3,523 Hispanic children, seen at the Los Barrios Community Clinic, located in a predominantly Hispanic area of Dallas, Texas. The survey took place between January 1, 1985 and December 31, 1986, with the subjects ranging in age from four to eighteen years. An initial oral examination was performed in all cases by an investigator using a dental mirror and standard dental light. Subjects were seated in a dental chair during their respective examinations. Radiographic examinations were made concurrently and consisted of maxillary occlusal and bitewing films, to screen for mesiodens.

RESULTS

In the 3,523 Hispanic children who were surveyed, seventy-six cases of mesiodens were found, forty-four cases in males and thirty-two in females (Table 1). Fifty-three cases were single and unerupted, while fourteen were single and erupted (Table 2). The nine additional cases consisted of two cases of multiple erupted mesiodens, four cases of unerupted multiple mesiodens, one case of fused and erupted, one case fused unerupted, and one case in which the patient had an erupted and an unerupted mesiodens. Two cases occurred in siblings.

Table 1 ☐ Correlation of sex with mesiodens: total sample group, 3,523*

Sex	Number children with mesiodens
Male	44
Female	32

*Number of males, 1,767; number of females, 1,756.

Table 2 ☐ Number and type of mesiodens among the seventy-six children.

Occurrence of mesiodens	Number of mesiodens
Erupted single	14
Unerupted single	53
Multiple erupted	2
Multiple unerupted	4
Fused erupted	1
Fused unerupted	1
Both erupted and unerupted	1

DISCUSSION

Located along the maxillary midline, mesiodens are the most common of the supernumerary teeth.[9] They can occur in a variety of ways; most commonly they are impacted, but they can be erupted, and can be found singly, multiple, in a fused state, directed upwards or downwards.[6] Their morphology can range from nearly normal to conical to very imperfectly formed; this is a function of the stage of differentiation of the formative cells.[10]

These supernumerary teeth can be responsible for a variety of problems in the dentition, such as over-retention of primary teeth, delayed eruption of permanent incisors, axial rotation of adjacent erupted teeth, root resorption of the incisors, formation of diastemas, cystic complications, and invasion of the nasal cavity.[11-13]

Extraction is the indicated treatment for mesiodens. Authorities remain divided as to when the unerupted or impacted mesiodens should be surgically removed. Some feel that impacted mesiodens should be removed immediately after diagnosis, especially if the tooth in question is not an immediate problem to the permanent dentition, in order to permit possible spontaneous eruption of the incisors and avoid possible orthodontic problems. Others advocate the delayed approach calling for apical maturation of the maxillary incisors at approximately eight to ten years of age, before removal of the mesiodens.[9]

The author would like to thank Dr. Marshal Lindner, Director of Dental Health Programs, Inc., Dallas, TX; Mr. Horace Sarabia, Director of Los Barrios Unidos Community Clinic; Ms. Nora Garza, RDH; Ms. Denise Montgomery, Ms. Janie Placencia and Mr. Price W. Kaler, Jr. for their assistance in this study.

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Continued growth of the dentinal papillae after extraction of neonatal teeth: report of case

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Premature eruption in the primary dentition has been observed and recorded by several authors. In a review, Massler and Savara defined the following terms: *Natal teeth* were defined as teeth that are present in the oral cavity at the time of birth, while *neonatal teeth* are those teeth that erupt during the neonatal period, birth to thirty days.[1]

Natal and neonatal teeth refer usually to the regular primary dentition and in the majority of the cases, are mandibular central incisors. They usually have a crown of normal shape and size, but the enamel is of a varying quality. The roots are not calcified at the time of eruption and the teeth are loosely attached to the soft tissues. Because of their extreme mobility, traumatization of the soft tissues or laceration of the breasts during feeding, natal or neonatal teeth are lost or extracted.[2-4] Some authors reported continued growth of the dentinal papillae, following removal of the crown.[3-7] In their reports, the structures which are thus formed vary from an irregular mass of dentine to a tooth-like structure without enamel.

Ryba and Kramer reported a case of an infant girl with two natal teeth (mandibular central incisors).[5] One was lost immediately after birth, and the other was removed three to four weeks later. At the age of thirteen weeks, the oral cavity was normal, except for the presence of two swellings on the gingiva, in the lower incisor region. Histological examination showed that the swollen masses resulted from the continued growth of the dentinal papillae, with the formation of both regular and irregular dentine and continued activity of part of Hertwig's sheath.

In a clinical and histopathological study of three cases of retained dentinal papillae, Southam found in all cases, a calcified mass or rootlike structure, which in no way resembled normal tooth structure.[6]

Bjuggren reported, in a clinical and radiological study on premature eruption in the primary dentition, on eight cases with some kind of tooth formation, after the early loss of a natal tooth.[3] These formations may be described chiefly as dwarfed roots.

Also Berman and Silverstone described some continued root development after extraction of a natal tooth.[7] In their clinical study on natal and neonatal teeth, Kates *et al* made an unusual observation: an infant had two natal teeth extracted soon after birth, the roots of which were seen on radiographs, three years later.[4] These roots resorbed naturally and required no treatment.

In this paper, an example of the complete growth of the dentinal papillae of the central lower incisors after extraction of neonatal teeth is described.

CASE REPORT

The patient was a five-day-old girl with neonatal mandibular central incisors. During an uncomplicated preg-

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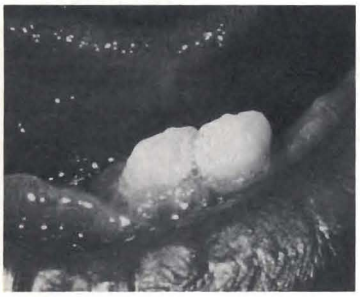

Figure 1. On the fifth day after birth, the two mandibular central incisors appeared as shown.

nancy, the mother was on a sodium-poor diet, from the third month. A healthy girl was born after a gestation of thirty-eight weeks, weighed 3480 grams and had a body length of 48 cm. The duration of the partus was twenty minutes. It was the third child of the thirty-five-year-old mother. There was no familial history of natal or neonatal teeth.

A day after birth, an elevation was seen in the region of the mandibular central incisors. On the third day, a tooth was partially visible. On the fifth day, at her first examination by the dentist, both mandibular central incisors were partially erupted and looked like normal primary teeth (Figure 1). No root formation was visible in a radiograph of the area. The presence of the two neonatal teeth resulted in a severe mastitis during breastfeeding. On the eleventh day, because of the feeding problem, the two teeth were extracted. They were loosely attached to the gums and the extraction was accomplished without anesthesia. Coagulation was normal. Extraction after the first ten days of life runs no risk of hemorrhage from hypoprothrombinemia (lack of vitamin K).[2,3] Extraction during the first ten days also poses no risk, if the newborn can be administered vitamin K to prevent excessive bleeding.

The extracted neonatal teeth were hollow. The labial and lingual portions of the incisal one third to one half of the hollowed crowns consisted of normal enamel. The gingival parts, however, showed irregularities of the enamel (Figure 2). After two and a half months following the extraction, a circumscribed hyperemic elevation of the gum tissue was observed in the same area (Figure 3). A week later, two toothlike structures, with the color of dentine, erupted in the area of the mandibular central incisors. In advance of the eruption of these structures, the mother had the impression that the child during feedings reacted to cold and heat. The mobility of both teeth was normal.

The development and eruption of the other primary teeth followed normal chronological order (Figure 4). The follicles of the permanent teeth were clearly visible in radiographs.

The roots of the abnormal central incisors resorbed

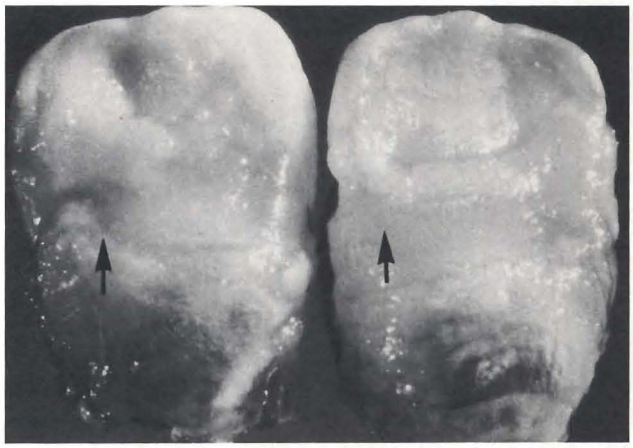

Figure 2. Note irregularities of enamel formation in the gingival thirds of the extracted teeth.

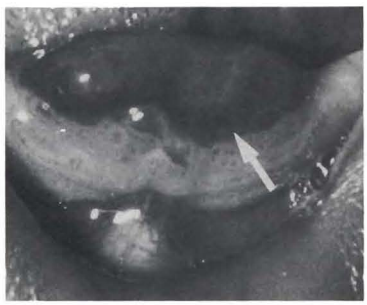

Figure 3. An elevated mass of hyperemic gum tissue is shown.

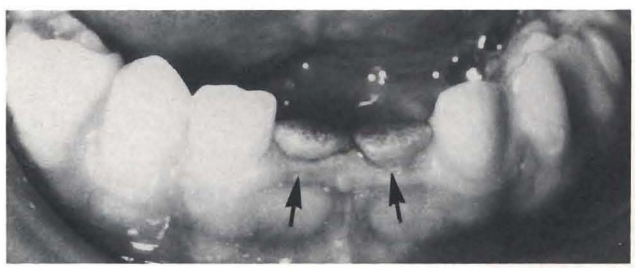

Figure 4. With the exception of the mandibular central incisors, the development and eruption of the primary dentition occurred in a normal chronological order. The picture was made when the child was five years old.

normally and the remaining portions were exfoliated. At the age of six years, two normal permanent central incisors erupted. These teeth showed no abnormalities in form and shape and the enamel was of good quality (Figure 5).

DISCUSSION

Southam suggested that on eruption, natal or neonatal teeth are of normal structure in accordance with de-

Figure 5. At the age of six years, two apparently normal permanent central incisors erupted in normal alignment.

velopmental age; but after eruption lateral movement in the cervical region leads to a disturbance in cervical dentine formation and premature degeneration of Hertwig's sheath in approximately 50 percent of the cases.[8]

The early extraction of the teeth described in this paper may be the reason that there was no degeneration and in turn led to continued growth of the dentinal papillae, left *in situ*.

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THE FUTURE

In the past ten years, significant changes in the style of dental practice have occurred. Fluoridation of water supplies, the increase in number of dental professionals, and dental health education have all had an impact on the incidence of caries. New emphasis is placed on "cosmetic dentistry" in addition to treating dental disease. The biotechnology of dental implants may provide a new dimension to the practice of dentistry. The practice setting is more varied and advertising is now accepted as a normal part of many dental practices. An increasing number of women are entering the profession, and no doubt entering the faculty and administration of many dental schools. It will be interesting to observe how their presence affects the educational process and the practice of dentistry. Our population is aging, and the medical complexity of the patients we treat is increasing. In many ways the practice of dentistry is even more closely linked to the practice of medicine than before. We must be vigilant in our knowledge of medical conditions, pharmacologic agents, and infection-control procedures.

As the turn of the century approaches, dental professionals will be challenged by new events, new research, new discoveries. They will have the opportunity, by being better informed and better educated, not only to respond to trends, but to set them.

Jong, A.W.: Community Dental Health,
St. Louis: The C.V. Mosby Company, 1988, p 37.

ABSTRACTS

Koroluk, Lorne D.; Jones, James E.; Avery, David R.: Analysis of orthodontic treatment by pediatric dentists and general practitioners in Indiana. J Dent Child, 55:97-101, March-April, 1988. This investigation analyzed the extent of orthodontic services currently being provided by pediatric dentists and general practitioners in Indiana. All 71 Indiana pediatric dentists primarily in private practice and 500 general practitioners were mailed a survey/questionnaire. Sixty-two percent of the pediatric dentists and 17.9 percent of the general practitioners surveyed provided comprehensive orthodontic treatment, results much higher than those of previous surveys of pediatric dentists and general practitioners. Pediatric dentists were found to provide significantly more comprehensive orthodontic treatment and spend significantly more time providing orthodontic treatment than general practitioners, especially those in communities of less than 25,000. Sixty- three percent of the practitioners surveyed had taken some type of continuing education in orthodontics. These practitioners spent significantly ($p<0.001$) more time treating orthodontic conditions, and treated more complex cases than those who had not taken such courses.

Orthodontics; Continuing dental education

Ranta, Reijo: Treatment of unilateral posterior crossbite: comparison of the quad- helix and removable plate. J Dent Child, 55:102-104, March-April, 1988. The aim of this retrospective study was to compare the quad-helix and removable plate with respect to effect and cost of treatment in the mixed dentition with unilateral forced crossbite. In the quad-helix group (25 children), expansion was accomplished with a prefabricated .036" quad-helix soldered to bands on the maxillary molars. In the plate group (25 children), the removable plates had a midline screw and four Adams clasps. The screw was opened by one quarter-turn each week. The crossbite was eliminated in all cases in the two groups. The respective results in the quad-helix group and in the plate group (in brackets) were: intermolar arch width increased 3.6 mm (3.7 mm); the total period of appliance therapy averaged 3.8 months (21.6 months), ranging from 2 to 6 months (12-30 months); the number of visits averaged 4.6 (16.0), ranging from 3 to 6 (11-22); number of appliances needed averaged 1 (1.7), and the costs of the appliances averaged $58 ($174). In the plate group, the average values of the laboratory costs were 3-fold, the number of visits 3.5-fold, and the expansion and retention time 5.7-fold more than the quad-helix group. The present treatment rationale with the quad-helix appliance is easy, effective, cost-efficient, and can be learned by every pedodontist for correction of unilateral crossbites in the mixed dentition.

Crossbite, unilateral/posterior; Quad-helix appliance; Removable plate; Interceptive orthodontics

Kronmiller, Jan E.; Nirschl, Ronald F.; Zullo, Thomas G.: Patient's age at the initial detection of interproximal caries. J Dent Child, 55:105-109, March-April, 1988. This study set out to determine the average patient's age at initial detection of interproximal caries for individual posterior tooth surfaces. Ninety-six patients between the ages of 2 and 14 years were followed longitudinally over a series of periodic oral examinations. The average patient's age at initial detection of interproximal caries ranged from 6.3 years for the maxillary primary canine to 11.7 years for the mandibular permanent first molar. Peaks in patient's age at initial detection of interproximal caries occurred between ages 6 and 8 for primary teeth—peaks that should be considered in establishing the timing and frequency of bitewing radiographs for children.

Interproximal caries; Radiographs, bitewing

Riolo, Michael, L.; TenHave, Thomas R.; Brandt, Douglas: Clinical validity of the relationship between TMJ signs and symptoms in children and youth. J Dent Child, 55: 110-113, March-April, 1988. Cross-sectional data on subjective symptoms and clinical signs of TMJ dysfunction were collected from 1342 subjects ranging in age from 6 to 17 years old. Statistically significant associations existed between certain symptoms and signs ($p<.0001$); however, these associations lacked correspondence as indicated by the sensitivity (from 2 percent to 40 percent) and false-positive rates (52 percent to 77 percent) of the symptom-related interview questions. These findings do not support drawing valid clinical conclusions from cross-sectional sign and symptom studies of TMJ dysfunction in children.

Temporomandibular joint; Symptoms and signs

Varpio, Mirja and Wellfelt, Boel: Disturbed eruption of the lower second molar: clinical appearance, prevalence, and etiology. J Dent Child, 55:114-118, March-April, 1988. Disturbed eruption of the second lower molar is a condition not often described in the dental literature. To study this aberration, 88 referred patients with 108 totally or partially impacted lower second molars were examined. The mean age of these patients was 15 years; 64 percent were male. A third molar was found adjacent to the affected second molar in 95 percent of cases. Local space shortage was seen in 90 percent of the cases. The prevalence of this disturbance overall is 1.5 per 1,000 individuals. Impactions in mesioangular and distoangular positions seemed to have been caused mostly by lack of space, whereas additional local factors had complicated many vertical impactions. Bite supervision should include early observance of the molar area for detection of disturbance in eruption of the lower second molar.

Second molars; Impaction; Eruption

Eidelman, Eliezer; Shapira, Joseph; Houpt, Milton: The retention of fis-

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sure sealants using twenty-second etching time: three-year follow-up. J Dent Child, 55:119-120, March-April, 1988. The retention of a self-polymerized fissure sealant applied after twenty seconds etching time was evaluated after three years. From the original 100 molars that were sealed, seventy-one teeth with 105 sites were available. The sealants were totally retained in 91 percent of the cases, after three years. The findings demonstrate that the retention rates of fissure sealants using twenty seconds etching time are comparable to those reported with the more conventional sixty seconds.
Sealants; Retention time; Etching time

Klein, Alan: Physical restraint, informed consent and the child patient. J Dent Child, 55:121-122, March-April, 1988. Parent's expressed, informed consent should be obtained before physical restraining devices are used on the child patient, in the course of dental treatment. Implied consent does not apply to any procedure not normally expected by an average, reasonable person; these procedures include the use of premedicating agents, the use of nitrous oxide sedation, or the use of physical restraint. It is a good, preventive idea to use a well-written general consent form. A specific consent form, clearly labelled, provides a strong defense in court for the dentist.
Informed consent; Physical restraint; Pedodontics; Implied consent

Bullen, Carl; Rubenstein, Loretta; Saravia, Mario E.; Mourino, Arthur P.: Improving children's oral hygiene through parental involvement. J Dent Child, 55:125-128, March-April, 1988. This study evaluated whether preschool children's oral hygiene would improve, if the parent, after receiving professional instruction, could demonstrate proficient toothbrushing. In the experimental group, twenty-four parents received a clinical demonstration and verbal instruction in the scrub-brush technique. They were asked to demonstrate proficiency in brushing their children's teeth using this technique. In the control group, twenty-six parents received the same brushing instructions, but did not clean their children's teeth. Baseline and four-week follow-up plaque and gingival scores showed improvement only in the plaque score ($p<.05$) for the experimental group. Gingival scores were unchanged. These results indicate the advantage of parental participation in their child's dental care, especially in the case of new patients.
Toothbrushing; Oral hygiene; Communication

Maruyama, Sizue and Koyaze, Takaaki: Effect of dental drawings and coloring on attitudes of child patients. J Dent Child, 55:129-132, March-April, 1988. Young children can feel great anxiety and/or fear when facing their dental examination and treatment, and may refuse to be examined. To help children overcome these emotions, we originated a method called "Dental Drawings and Coloring". We investigated whether the new method might be effective for 207 children between the ages of two and four who had completed treatment and had returned for their first check-up, about three months later. Results showed that using the method of "Dental Drawings and Coloring" worked fairly effectively in alleviating their anxiety and fear.
Pedodontics; Anxiety; Pretreatment counseling

Hayes, Peter A.; Prince, Michael T.; Hayes, Kimberly: The suicidal adolescent. J Dent child, 55:133-136, March-April, 1988. Suicide is a major cause of death among young people, surpassed only by homicide and accidents. To help decrease the rate of suicide, both the public and health professionals, including dentists, must be educated about the precipitating factors of suicide, common pre-suicidal behaviors, and methods for the prevention and intervention of suicide.
Suicide; Adolescents; Intervention; Health professionals