ASDC AMERICAN SOCIETY OF DENTISTRY FOR CHILDREN

NOVEMBER—DECEMBER 1989

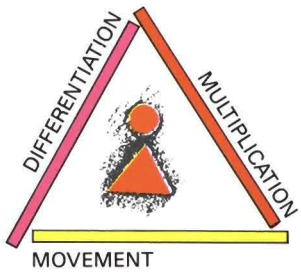
JOURNAL OF DENTISTRY FOR CHILDREN

The six-year-old manifests his bipolarities in many different ways. He flies quickly from one extreme to another. He is in a phase of development where alternatives crowd upon him rather thickly. He is not fully oriented. He is in new territory. His motor impulses and interpersonal relationships are not under his command. Certain primitive features in the maturity traits of the six-year-old are vaguely characterized by such adjectives as impulsive, undifferentiated, volatile, dogmatic, compulsive, and excitable. His spontaneous drawings are crude but realistic, and sometimes suggestive of the graphic renderings of early man.

ARNOLD GESELL—1946

COME ALONG IN THEN, LITTLE GIRL!
OR ELSE STAY OUT!
BUT IN THE OPEN DOOR SHE STANDS
AND BITES HER LIPS AND TWISTS HER HANDS
AND STARES UPON ME TROUBLE-EYED:
"MOTHER," SHE SAYS, "I CAN'T DECIDE!
I CAN'T DECIDE!

—EDNA ST. VINCENT MILLAY



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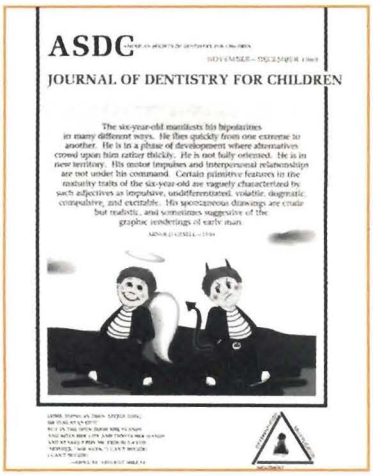
Volume 56 Number 6 November-December, 1989



The six-year-old is capable of a quick shift in personality, from the very good to the very bad or the reverse, in a matter of seconds. Art and design by Sharlene Nowak-Stellmach.

SURVEYS

CLINIC


467


452


445

For the busy reader

A fourteen-year follow-up study of traumatic injuries to the permanent dentition — page 417

The frequency of traumatic injuries to permanent teeth was studied in a Swiss population sample consisting of 262 children. The prevalence of injuries was 10.81 percent. The teeth most commonly injured were the maxillary central incisors (80 percent) and the most frequent type of injury was an enamel-dentin fracture without pulp exposure (53 percent).

Requests for reprints should be directed to Dr. Sabine C. Maréchaux, 20, Cours de Rive 1207 Genève, Switzerland.

Pulpotomy medicaments for vital primary teeth — page 426

This paper, subtitled "Surveys to determine use and attitudes in pediatric dental practice and in dental schools throughout the world," reviews the literature and reports on a survey sent to Canadian pediatric dentists and dental schools worldwide.

Requests for reprints should be directed to Dr. Avram, Department of Pediatric Dentistry, Faculty of Dentistry, University of Toronto, 124 Edward Street, Toronto, Ontario, Canada M5G 1G6.

Fetal alcohol syndrome and the realities of our time — page 435

The occurrence of FAS is well documented in the literature but is recognized only minimally by the general public, with more than 5,000 episodes each year in the U.S. Education is sorely needed.

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

Cotton roll isolation versus Vac-Ejector® isolation — page 438

No significant difference in sealant retention was found between the two isolation methods described in this study. After application and a minimum of six months, the retention of the sealants applied to 523 teeth was evaluated. The Vac-Ejector® method seems to require less operator effort and can serve as an alternative to isolation with cotton rolls.

Requests for reprints should be directed to Dr. A. Jeffrey Woods, Assistant Professor, Department of Pediatric Dentistry, Medical College of Virginia, Virginia Commonwealth University, MCV Station, Box 566, Richmond, VA 23298-0566.

The efficacy of rubber dam isolation in reducing atmospheric bacterial contamination — page 442

Results show a highly significant reduction in airborne bacteria when the rubber dam is used during conservative procedures, particularly in the vicinity of the operator and the dental assistant.

Requests for reprints should be directed to Dr. L.P. Samaranayake, Department of Oral Medicine & Pathology, Glasgow Dental Hospital and School, 378 Sauchiehall Street, Glasgow G2 3JZ, Scotland.

An analysis of compound and complex odontomas — page 445

The study includes 396 odontomas, each case assigned to one of three categories using commonly accepted histologic criteria for compound and complex forms. Compound odontomas were the most common type (70 percent of all cases), and occurred most often in the 11-to-15-year-old group and in the maxillary incisor area or the canine regions of either jaw.

Requests for reprints should be directed to Dr. Ronald W. Katz, Building 10, Room 1N113, National Institute of Dental Research, 9000 Rockville Pike, Bethesda, MD 20892.

The use of dental sealants in the Washington State Medical Assistance Program: a second-year report — page 450

The second-year utilization and cost data were reviewed for this program, covering a total of 6,814 children receiving sealants (17.2 percent of all individuals who made at least one visit to a dentist). Sealants were placed on 21,685 teeth (average, 3.18 per child), which was 10.7 percent more than in the first year of the program. There were 726 dentists who participated in the program, an increase of 22 percent.

Requests for reprints should be directed to Dr. Robert C. Faine, 7015 S.E. 32nd Street, Mercer Island, WA 98040.

A study of behavior modification for developmentally disabled children — page 452

A tape-slide series, using a desensitization and modeling approach, was developed to prepare three- and four-year-old developmentally disabled children for an initial dental examination. A clown and a four-year-old girl were used as models. Twenty-eight children participated in the study, forming the two groups. Children exposed to the tape-slide series showed worse behavior and a higher heart rate than children not exposed to the series. The subjective dentist's evaluation showed the impossibility of preventing a biased interpretation of behavior by the evaluator.

Requests for reprints should be directed to Dr. Jorge M. Davila, Eastman Dental Center, Department of Pediatric Dentistry, 625 Elmwood Avenue, Rochester, NY 14620.

1980-1990: What a difference ten years have made in the future of pediatric dental practice — page 458

A review is provided of the developments in pediatric dentistry during the 1980s. At the beginning of the decade, the future appeared bleak for pediatric dental practice. For 1990, we can look forward with greater optimism—knowing what a difference ten years have made in the practice of pediatric dentistry. The ratio of dentists-to-population has begun to decline.

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

Change in dental treatment needs in an urban pediatric population, 1977 to 1987 — page 463

Decreasing caries activity in children has adversely affected the educational programs in clinical pediatric dentistry. Dental records of 760 children from four urban schools in Kansas City, MO, were examined in conjunction with a program designed to meet this group of patients' needs while facilitating the undergraduate educational requirements of dental students at the University of Missouri. Results indicated a significant decrease in the percentage of patients requiring simple or complex amalgam fillings from 1977 to 1987.

Requests for reprints should be directed to Dr. Paulette Spencer, Assistant Professor, Department of Pediatric Dentistry, UMKC School of Dentistry, 650 E. 25th Street, Kansas City, MO 64108.

A fourteen-year follow-up study of traumatic injuries to the permanent dentition

Surveys

Aysin Darendeliler Kaba, Med Dent
Sabin C. Maréchaux, DDS

Because of the increasing number of dental accidents in school children, during the past few years, it was decided to reevaluate treatment results of the traumatized permanent teeth that were previously documented in the Pedodontic Clinic, University of Geneva Dental School.

The study population consisted of 262 children who had been registered at the Pedodontic Clinic for treatment of injuries to permanent teeth sustained between October 1974 and March 1988. Of the 262 children, 156 were boys and 106 were girls, for a total of 445 traumatized teeth.

At the time of the first examination, the ages of the children ranged from six to eighteen years. The type of tooth fracture was noted on the accident form according to the standard Ellis classification:

- ☐ Class I: Simple fracture of the crown, involving little or no dentin.
- ☐ Class II: Extensive fracture of the crown, involving considerable dentin, but not the dental pulp.
- ☐ Class III: Extensive fracture of the crown, involving considerable dentin and exposing the dental pulp.
- ☐ Class IV: The traumatized tooth that becomes nonvital, with or without loss of crown structure.

Aysin Darendeliler Kaba is a postgraduate student in Pedodontics; and Sabine C. Maréchaux was head of the Pedodontic Clinic at the University of Geneva Dental School, Switzerland until October 1988 and is now exclusively in private practice.

- ☐ Class V: Total tooth loss.
- ☐ Class VI: Fracture of the root, with or without loss of crown structure.
- ☐ Class VII: Displacement of the tooth, without fracture of crown or root.
- ☐ Class VIII: Fracture of the crown "en masse" and its replacement.[1]

Total luxations were treated as a separate classification (Class V). All root fractures were listed together in this study. Displacements were classified as subluxation including intrusion and extrusion. Those cases resulting in no displacement, but in mobility, were also grouped as subluxation injuries. Radiographic examinations were performed in nearly all cases. Treatment was carried out as soon as possible.

LITERATURE REVIEW

Because of the numerous publications concerning the study of the different types of trauma to permanent teeth, Table 1 was assembled to compare results from 1957 to 1988. It is difficult to explain the great differences among the authors' total frequencies.[1-29] The differences may be attributed to the environmental variations of the study areas, examination methods, and materials. Prevalence of traumatic injuries varies from 4.2 to 22 percent among the children examined.[1,2,11,13,14,18,19,26,29] It was evident that boys sustain injuries to the permanent dentition almost twice as often as girls.[1-7,11,15-17,21,26,28]

The largest number of injuries for both sexes is found in children eight and nine years of age, in agreement with the results of this study.[16] There is a strong dominance of trauma to the maxillary region.[1-3,5-7,13-16,18,19,23,27,29] No significant difference was found between trauma in the left and right sides of the mouth.[6,7,13,15,18,23] Dental trauma usually affects only a single tooth; some studies, however, indicate that two teeth are more common than a single tooth.[3,15,16,18,20,23,29]

The variation in the distribution of the types of trauma is attributed to the differences in definition of classification by the authors. For example, the Ellis classification suggests a basis for the standardization of treatment; Hargreaves and Craig use a more simplified classification of trauma; whereas Andreasen's classification includes injuries to the teeth, supporting structures, gingiva, and oral mucosa, and is based on the anatomical, therapeutic, and prognostic considerations that can be applied to both dentitions.[1,21,30]

In Table 1, classifications are shown as in the following example: Ellis Class I fractures show a frequency of 9.3 to 67.2 percent, while Ellis Class II fractures range from 18.9 to 57.6 percent.

In analyzing healing complications after dental injuries, Ellis Class I fractures represent a minimal risk of pulp or periodontal damage, while in Class II cases, pulp necrosis appears to be 0.3 percent, 3.2 percent to 20 percent.[16,29,31,32] Crown fractures with exposed pulps have the worst prognosis, because of a 45-percent possibility of pulpal necrosis.[15] Pulp capping was successful in 90.5 percent of cases, and partial pulpotomy in 96 percent of cases.[33,34] In Class IV cases, pulpal necrosis was found in 2 percent and pulp canal obliteration in 2.2 percent of cases.[16]

The majority of reimplanted teeth show root resorption after a certain period.[35] In a follow-up study, only 10 percent of the teeth reimplanted within thirty minutes showed resorption; on the other hand, root resorption occurred in 95 percent of the cases when the extraoral period exceeded two hours.[36]

Root fractures seem to follow the healing pattern of luxated teeth with respect to the development of pulp necrosis. The dislocation has a marked influence on pulp survival.[31] The rate of pulp necrosis varies from 20 to 44 percent.[37-40] In subluxation cases, pulp necrosis ranges from 26 percent to 47 percent.[31,41] Pulp canal obliteration was found in 26 percent of the cases and root resorption in 4 percent.[41] In extrusive luxations, pulp necrosis ranges from 64 percent to 98 percent, pulp canal obliteration in 24 percent, and progressive root resorption in 7 percent of cases examined.[31,41] In intrusive cases, pulp necrosis is found to occur in 96 percent of the cases examined, pulp canal obliteration in 4 percent and progressive root resorption in 52 percent.[41]

Many teeth with fractures involving crown and root were extracted, because restoration was not considered possible. Treatment procedures recently introduced, such as surgical exposure of the fracture surface by gingivectomy or orthodontic procedure, whereby forced extrusion provides access to the fracture site, have provided new treatment options. Studies of the long-term results of these treatments and their comparative successes are lacking.[31]

MATERIAL AND METHOD

The material consists of the existing case histories and radiographs of the children taken at the first clinical examination, between ages six to eighteen years, in the period of October 1974 to March 1988.

Of the 2976 patients who came to the clinic, 322

Table 1 ☐ Analysis of published reports of traumatic injuries, covering the period from 1957 to 1988.

Authors	*S.S.	*F.P %	Age	*R	I %	II %	III %	IV %	V %	VI %	VII %	int %	ext %	VIII %	*Max %
Ellis (1960)		4.2		2.5:1											
Down (1957)	329 p* 471 t*		7-18	1:1											80
Gelbier (1967)	86 p 141 t		6-15	1.9:1	24.8	57.6	17.6		2.1	2.8	6.3				85
Parkin (1967)	94 p 161 t		7- 9	1.7:1					3.7						
Magnusson (1969)	237 p 460 t		7-15	3.4.:1	16	34	10	4		3	43	11			
Magnusson (1969)	184 p 258 t		7-16	4:1	27.5	55.4	17								
Andreasen (1970)	1298 p 3026 t		0-80	2.3:1	19		8		16	7	15	3	28	5	
Gutz (1971)	1166 c* 236 p	20.2	6-13	1.1:1											
Zadik (1972)	948 p 1195 t	8.7	6-14	1.3:1	41	47	8	–	2.9		0.5			–	89
Andreasen (1972)	487 p 145 t	22.3	9-17		64.8		4.8	12.4	0.7	–	16.5	0.7	–	–	
O'Mullane (1973)	2792 p 357 t	12.8	6-19												
Hedegard (1973)	2582 p 4926 t		7-15	2.3:1	39.6	18.9	3.8	8.7	0.9	0.7	29.9				65
Clarkson (1973)	756 p	9.8	11-17	1.1:1											
Ravn (1974)	9665 p 12989 t	12.9	6-17	1.6:1	26.9	35.1	3.4		0.5	0.4	14.6			0.06	
Jarvinen (1979)	1614 p				67.2	23.3	1.8		1.7	0.2				–	82
Macko* (1979)	1314 p	19.0	12-15	1:1	53 m	38 m 49 f	9 m 42 f	9 f							
Garcia-G. (1979)	105 p 149 t				13.3	43.5	–	21.7	–	4.4	17.4	–	–	–	
Zadik (1980)	252 p 414 t		1- 6 7-17	2:1	7.5	48.1	6.5	16.4	3.6	1	3.1	3.9	1.9	7	
Galea (1984)	307 p 725 t		8-16		38.2		12.4		9	2.9	30.7	1.8	8.3	2.9	53
Meadow (1984)	338				9.3	25.7	5.2		3.9	2.1	52.4	1.2			
Judd (1985)	207 p		0- 6 7-15	3:2											
Garcia-G.* (1986)	1200 p	18.9	7-16	1.3:1	53.4 42.3	24.0 31.6	3.8 5.4	1.8 2.7	– –		3.6 8.1	– –	– –	1.2 1.8	
Oluwole (1986)	5000 c 250 p		11-21	1.7:1											89
Stockwell (1988)	117 p 1365 t	1.7	6-12		31.2	42.7	4.6	1	0.4	0.4	3.5				

*: S.S: sample size; F.P: fracture prevalence; R: ratio; Max %: Maxillary incisors percent; p: patients; t: teeth; c: children
Macko (1979)- m: male, f: female
Garcia-G. (1986)- 1st row private, 2nd row public school.

came because of accidents to permanent teeth (10.8 percent). The examinations were made by several dentists who also recorded the signs and symptoms of the injuries. Certain variables were recorded according to the observer's clinical assessment. The number of radiographs taken varied according to the extent of the injury. Sixty of the 322 accident cases were excluded from the study because of incomplete documentation, such as unidentified radiographs and registration data.

After the elimination of the above group, the study group includes 262 patients with 445 injured teeth (106 girls, 156 boys). The treatment of thirty-five children was completed in private practices after their emergency treatment.

It should be mentioned that the population of the Republic and Canton of Geneva is about 300,000, so that the approximately 3000 patients who came to the Pedodontic Clinic represent about 1 percent of the total population.

RESULTS

During the period of October 1974 to March 1988, a total of 445 traumatic teeth of 262 patients were treated. The ratio of boys to girls was 1.47:1, showing that boys receive more injuries than girls. Thirty-five percent of the boys at the ages of nine to ten years were the largest accident group, while 23 percent of girls (the largest group among the girls) received dental injuries at the age of nine years. The teeth most commonly injured were the maxillary central incisors (80 percent). The maxillary region was involved in 90.7 percent of cases. There was a slight difference between injuries on the left and right sides of the mouth, 52.1 percent and 47.8 percent, respectively (Table 2).

Table 2 ☐ Evaluation of the distribution of traumatic injuries among the teeth of children reporting to the Pedodontic Clinic of the University of Geneva Dental School, 1974 to 1988.

Identification of injured tooth	13	12	11	21	22	23
N*	(3)	(21)	(168)	(188)	(24)	–
Percent Total 90.7%	0.7	4.7	37.7	42.2	5.4	

Identification of injured tooth	85	46	43	42	41	31	32	33	36
N*	1	1	–	(4)	(15)	(15)	(3)	–	2
Percent Total 9.3%	0.2	0.2		0.9	3.4	3.4	0.7		0.4

* Number of teeth

The fracture cases were classified according to type of fracture, using the Ellis classification. Fourteen percent of fractures were Class I, 53 percent were Class II, and 7 percent were Class III, for a total of 74 percent of all the injured teeth. The fracture of the mesial corner in Class II cases was 47.4 percent of all the Class II cases. In Class I and Class III cases, the incisal edge fracture is more common than the mesial or distal corner fractures.

Class IV cases represent less than 3 percent. Traumatic injuries involving avulsed teeth accounted for 5.2 percent of all the cases. Root fracture occurred in 1.1 percent of the traumatized teeth.

Subluxation injuries and luxation injuries were classified in the same group (10 percent). Intrusive injuries accounted for 3.6 percent of all reported trauma; only 1.1 percent of these cases were extrusive cases. Crown fractures (Class VIII) were found in 2.2 percent of the cases. These results are summarized in Table 3.

Emergency treatment of crown fractures involving dentin consisted of a calcium hydroxide dressing maintained in place by a band cemented with IRM*. Teeth with fractures exposing the pulp were treated either with pulp capping using a calcium hydroxide dressing or by a vital pulpotomy or root canal extirpation. After a recovery interval, the tooth was restored with a composite resin, using the etching technique.

Of the 262 patients, thirty-six (14 percent) were treated in private offices, after their emergency treatment, using bands, archwires or other devices. One hundred and fifteen patients (44 percent) received emergency treatment and composite resin restorations at the Pedodontic Clinic, but did not return for the recall check-up. One hundred and nine patients (42 percent) returned within a period ranging from one month to 9 years for recall evaluations. The following is a résumé of the results obtained at the recall evaluation.

Table 3 ☐ Evaluation of the frequency of traumatic injuries by type, of the teeth of children reporting to the Pedodontic Clinic of the University of Geneva Dental School, 1974 to 1988.

Fracture	N	Percent	
Class I	63	14.2	74.2 percent
Class II	234	52.6	
Class III	33	7.4	
Class IV	13	2.9	
Avulsion	23	5.2	
Root	5	1.1	
Luxation	43	9.7	14.4 percent
Intrusion	16	3.6	
Extrusion	5	1.1	
Crown fractures	10	2.2	
Totals	445	100.0	

Figure 1. An eight-year-old girl with a typical Ellis II crown fracture of the maxillary permanent right central incisor (11) involving the distal corner.

Class I

Of the sixty-three teeth seen in this category, one (1.6 percent) was seen in a private office, thirty-nine (61.9 percent) were not controlled, and twenty-three (36.5 percent) were controlled. Of the latter, seventeen (74 percent) were treated by polishing the traumatized area; five (21.7 percent) were restored with composite resin; and one (4.3 percent) required endodontic treatment four years after the accident.

Class II

Of the 234 teeth in this category, twenty-four (10.2 percent) were treated in a private office; 109 (46.6 percent) were uncontrolled; 101 (43.2 percent) were controlled. Of the 101 teeth, twelve (11.8 percent) required endodontic treatment: two teeth, a month after the trauma occurred; one tooth, 1.5 months after trauma; one tooth, five months after trauma; four teeth, a year posttrauma; two teeth, two years posttrauma; one tooth, three years posttrauma; one tooth, six years posttrauma.

Three patients had a second accident in which one of the teeth had to be extracted, because of the crown fracture.

Figure 1 shows an example of an enamel-dentin fracture.

Class III

Of the thirty-three teeth in this category, 4 (12.1 percent) were treated in a private office; seven (21.2 per-

*IRM Intermediate Restorative Material by Caulk.

Figure 2. The palatal view of a pulp exposure of the maxillary permanent left central incisor (21) of a twelve-year-old boy.

cent) were not seen after the emergency appointments (two pulpotomies were done); twenty-two (66.7 percent) were controlled. Of the twenty-two teeth: seven (31.8 percent) required pulpotomy; four (18.2 percent) required endodontic treatment, three immediately after the trauma (one ankylosed two months later), and one tooth, seven months posttrauma.

Figure 2 shows the pulp exposure of a fractured maxillary permanent left central incisor.[21]

Class IV

Of the thirteen teeth in this category, two (15.4 percent) were treated in a private office; two (15.4 percent) were not seen after the emergency visits; nine (69.2 percent) were controlled. Of the latter, six (66.6 percent) required endodontic treatment: one tooth, a month after the accident; one tooth, two months posttrauma; two teeth, three months posttrauma; two teeth, a year posttrauma (both were involved in a second accident, were extracted, and replaced with bridges); in two teeth (22.2 percent), the root canals became calcified; and in one tooth (11.1 percent) the root became shortened.

Figure 3 shows the radiographs of the pulp obliteration of the maxillary permanent right central incisor (11) following traumatic injury.

Class V (Total avulsion)

Of the twenty-three teeth in this category, seven (30.4 percent) were treated in a private office (two teeth were reimplanted); five (21.7 percent) were not seen after the emergency visits; eleven (47.9 percent) were controlled, including five reimplantations. Among the twenty-three teeth, there were seven (30.4 percent) reimplantations; two patients attended private practices after reimplantation and stabilization of the traumatized teeth. Of the five remaining reimplantations, one was still successful after a year, and one after nine years; one tooth was treated endodontically immediately after reimplantation, and a Class III restoration placed (ankylosis occurred two months later, and extraction was planned); one tooth was treated endodontically six months later, because of external resorption and extraction was planned; one tooth was treated endodontically, six years later. Of the nine patients remaining in the study group, four required tooth-replacements.

Figure 4 shows the total luxation of a maxillary permanent left central incisor.[21]

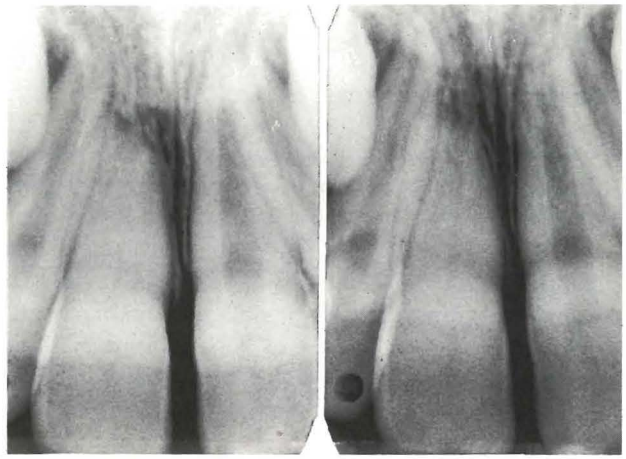


Figure 3. A nine-year-old girl had an accident when she was six years old. The radiograph on the left shows obliteration of the pulpal canal with a short root of the maxillary permanent right central incisor (11). The radiograph on the right shows the situation a year later.

Figure 4. Total luxation of the maxillary permanent left central incisor (21) of a nine-and-a-half-year-old boy. The reimplantation was contraindicated because of the excessive lapse of time from the time of the injury.

Class VI (Root fracture)

Of the five teeth in this category, three (60 percent) were treated in a private office; and two (40 percent) were controlled. Of the two teeth, one was intruded and required endodontic treatment a year later; after four years, treatment was judged to be successful. The second tooth was vital, six months posttrauma.

Figure 5 shows a fracture of the middle third of the root of the maxillary permanent right central incisor.[11]

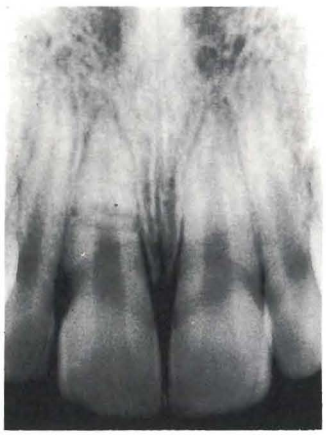


Figure 5. A twelve-year-old girl with a root fracture in the middle third of her maxillary right permanent central incisor (11). The radiograph was taken immediately after the accident.

Class VII (Luxation)

There were sixty-four teeth in this category: thirteen (30.3 percent) were treated in a private office (seven luxations, four intrusions, one extrusion); fourteen (21.9 percent) were not seen after emergency visits (eight luxations, five intrusions, two extrusions); thirty-seven (57.8 percent) were controlled (twenty-eight luxations, seven intrusions, two extrusions). Of the twenty-eight luxation cases, eleven (39.3 percent) were treated endodontically (one, fifteen days posttrauma plus a Class II restoration; five, two months posttrauma; two, three months posttrauma; one, seven months posttrauma; one, thirteen months posttrauma plus a restoration; one, eight years posttrauma); of the seven intrusion cases, four (57.1 percent) were treated endodontically (one, immediately posttrauma; one, forty-five days posttrauma plus a restoration; one, a year posttrauma; one, seven years posttrauma plus a restoration); of the remaining three cases, one (14.3 percent) suffered a shortened root and two (28.6 percent) tested vital. Both extrusion cases required endodontic treatment, four months after their accidents.

Figure 6 represents a luxation case with extrusion of the maxillary permanent left central incisor of a twelve-year-old boy.[21]

Figure 6. A twelve-year-old boy with a subluxation of the maxillary permanent right central, left central, and left lateral incisors (11,21,22), as well as extrusion of the maxillary permanent left central incisor (21). Bands and archwires were placed immediately for stabilization.

Class VIII (Crown fracture)

There were ten teeth in this category: three (30 percent) were treated in a private office (onr pulpotomy was done, and included in the trauma were a fracture of the temporomandibular joint, and fractures of two canine teeth); four (40 percent) were seen only for emergency treatment (one pulpotomy was done; the other patient suffered chin trauma and three teeth with crown fractures in the premolar-molar areas); three cases (30 percent) were controlled (in the first case, endodontic treatment was done, although two years later, a second fracture made extraction necessary; in the second case, endodontic treatment failed and the tooth

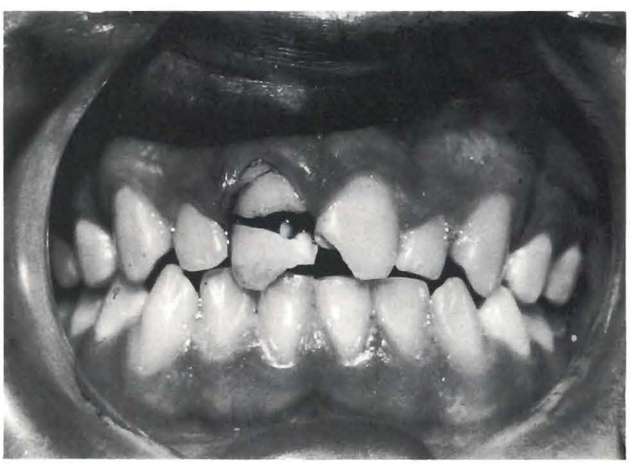


Figure 7. Complicated crown-root fracture of a maxillary permanent right central incisor (11), as well as a mesial enamel-dentin fracture of the left central incisor (21) of a sixteen-year-old boy. The crown portion of tooth (11) was removed and endodontic treatment performed.

was extracted; in the third case, a pulpotomy was done, after six months endodontic treatment was provided, and after a twoyear period of control, treatment was considered to have been successful).

Figure 7 shows a crown fracture of the maxillary permanent right central incisor; the arrow in Figure 8 indicates the fracture line.[11]

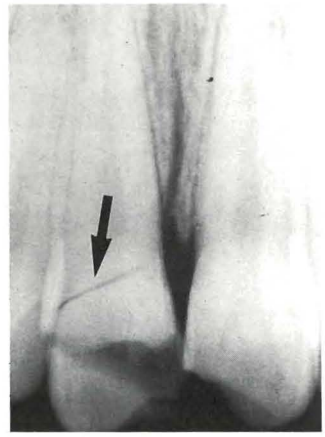


Figure 8. The radiograph of the patient in Figure 7 taken immediately after the accident shows the crown-root fracture line (arrow) of tooth 11.

DISCUSSION

The results are supported by several clinical studies and confirm the assumption that an enamel fracture is an injury with a very favorable prognosis.[29] In the studies reported by Stälhane and Hedegard, enamel fractures resulted in 0.2 percent pulp necrosis, 0.2 percent apical root resorption, and 0.4 percent reduced pulpal lumen; whereas Ravn reported 1-1.7 percent pulp necrosis in his cases of enamel fractures.[16,29,30] When there is damage to the supportive tissue, pulp necrosis occurs in 8.5 to 14 percent of the cases.[29] In the present study, only one tooth required endodontic treatment, four years after the accident.

When the crown fracture exposes dentin (Ellis Class II) and is left uncovered, a bacterial invasion of the pulp via the dentinal tubules may occur.[31,43] Pulp necrosis was found in a frequency of 0.5-20 percent.[15,16] In the study published by Ravn, necrosis occurs in 9.5 percent of major fractures, 6.6 percent of straight-line fractures, and in only 3.8 percent of minor fractures.[32] In cases involving enamel-dentin fractures only, without loosening and/or tenderness, 3.2 percent lose their vitality; while the ratio rises to 5.8 percent and 30 percent, respectively, in enamel-dentin fractures involving tenderness and/or loosening. In our study, the percentage of pulp necrosis was found to be 11.8 percent.

In Class III cases, various procedures have been developed by different clinicians to preserve the exposed pulp: such as pulp capping, and coronal and cervical pulpotomy.[44-49] In a study by Ravn, pulp capping was found to be successful in 90.5 percent of cases.[33]

In a study reported by Cvek, in which the conditions of the exposed pulps of sixty permanent incisors were assessed, a 96-percent success rate was seen, when the pulp was amputated 2 mm below the exposure site and covered with a calcium hydroxide dressing.[34] Because obliteration of the pulpal canal and necrosis of the pulp are frequent long-term complications, however, cervical pulpotomy is commonly regarded as a temporary treatment that should be followed by partial pulpectomy after the root has matured.[30] The observations suggest, however, that such a policy would have prevented these complications in a minority of the children and the majority appeared to maintain a vital pulp within the radicular portion of the root canal.[49]

In another study, 45 percent pulpal necrosis was found, whereas Magnusson and Holm reported that pulpal surgery was performed in all fractured teeth in which the pulp was involved.[5,15] In the present study, 31.8 percent of the teeth required a pulpotomy, while 18.2 percent needed endodontic treatment.

Class IV cases, in which there is no abnormal loosening or displacement, but characterized by tenderness to percussion, there should be a follow-up period of at least one year after the accident.[30] In this study, of the nine teeth controlled, six teeth required endodontic treatment after one year; two teeth calcified after three years; and one tooth had a short root after a year of control.

Reimplantation of avulsed permanent teeth is usually followed by a number of complications, such as pulpal necrosis and internal or external root resorption. External root resorptions fall into three categories based on their clinical, radiographic, and histologic appearance: namely, surface, inflammatory, and replacement (ankylosis) resorption.[31,50-54] In the study by Stälhane and Hedegard, only seven teeth with total luxation were reimplanted.[16] One of these cases showed no pathological signs when examined eight years later. In another study, five teeth were reimplanted and of these, four teeth were extracted because of extensive root resorption or ankylosis.[5]

In assessing the five reimplantations, two teeth were considered successful without complications. The others were endodontically treated, but resulted in either ankylosis after two months or continuing external resorption.

The management of traumatized anterior teeth with root fracture depends mainly on whether the fracture involves the coronal, middle, or apical third of the root.[21]

The rate of pulpal necrosis has been found to vary from 20 to 44 percent.[38-40] In this study, the available data show only two successful root-fracture cases.

Luxation of permanent teeth occurs frequently. It is concluded that the immediate and future prognosis for the pulp is best, if root formation is still incomplete at the time of the accident.[55] It is presumed that the survival or death of the pulp after luxation is related primarily to the degree of trauma inflicted on the pulpal vascular supply. The damage is apparently related to the type of luxation. It was found that pulpal necrosis was recorded in 52 percent of luxated teeth and progressive external root resorption in 11 percent.[41] Another study shows pulpal necrosis developed in 11.6 percent of the subluxated teeth and 54.1 percent of the luxated teeth. Pulpal necrosis was found to be a very frequent complication, occurring in a fifth of all cases.[56] In another study, Andreasen examined moderate injuries.[57] The majority were extrusion or lateral luxation cases, affecting both pulpal and periodontal structures. He proposes that transient apical deterioration appears to be a phenomenon linked to the repair process in the traumatized pulp or pulp and periodontium of luxated mature teeth, which return to normal when repair is complete. In the present study, 39.3 percent of luxation cases were treated endodontically; 57.1 percent of the intrusion cases and all of the extrusion cases required endodontic treatment.

Crown-root fractures, mostly classified as either a crown or root fracture, comprised 0 percent to 7 percent of the injuries affecting the permanent dentition.[3,5,7,10,13,14,17,19,20,22,23,28] In the present study, of the ten crown fractures, three received endodontic treatment. One later required extraction.

SUMMARY

A 10.8 percent prevalence of traumatic injuries was found in a group of 262 patients, ranging from six-to-eighteen-years of age over a fourteen-year period.

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VICTIMIZATION OF MOTHERS OF ABUSED CHILDREN

To search for indicators of violence against mothers of child abuse victims by husbands or boyfriends, the women's medical records were reviewed and compared to records of mothers of a nontraumatized child comparison group. Of the 32 children ascertained in a 6-month interval, the records of mothers of 19 (59.4 percent) were diagnostic or highly suggestive of current or previous victimization. Although the prevalence of documented violence against the mothers of children in the comparison group was an unexpectedly high 16 percent, the case-control difference was highly significant ($p < .001$). Although differences were found in the (younger) ages and (higher) parity of mothers of abused children, these differences did not predict risk of mothers' exposures to violence in a multivariate analysis. The rate of violence against single mothers of child abuse victims, however, was four times the rate against mothers who were married ($P = .022$). These findings suggest a need to broaden the diagnostic conceptualization of child abuse to include maternal victimization and argue for including data concerning maternal risk in formulating diagnoses and disposition plans for abused children.

McKibben, L. *et al*: Victimization of mothers of abused children: A controlled study.
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Pulpotomy medicaments for vital primary teeth

SURVEYS TO DETERMINE USE AND ATTITUDES IN PEDIATRIC DENTAL PRACTICE AND IN DENTAL SCHOOLS THROUGHOUT THE WORLD

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The purpose of this study was to determine:

- ☐ The medicaments and treatment techniques currently utilized for pulpal procedures on vital human primary teeth by Canadian pediatric dentists.
- ☐ The medicaments and treatment techniques currently taught for pulpal procedures on vital human primary teeth by dental schools throughout the world.

REVIEW OF THE LITERATURE

Since its introduction in 1904, formocresol has become one of the most widely studied dental medicaments.[1] In North America, it is most frequently associated with the pulpotomy procedure performed on primary teeth.[2,3,]

Currently, the most widely used formulation of formocresol is 19 percent formaldehyde, 35 percent cresol in a solution of 15 percent glycerin, and water.[4] The active components of formocresol are formaldehyde and cresol. Glycerin is used as an emulsifier and to prevent polymerization of the formaldehyde.[5]

Formaldehyde, the simplest of the aldehydes, is a normal metabolite and a necessary component in the synthesis of certain essential biochemical compounds in man and other animals, and is not considered toxic, therefore, at low levels of exposure.[6]

Most people come into contact with formaldehyde in daily life, because of its presence in polluted air and consumer products such as particle board, plywood, paper, home insulation, resins, leather and agricultural products, permanent-press fabrics, preservatives, drugs and cosmetics. Occupational guidelines and the controversy over exposure to formaldehyde have been discussed.[7]

As the classic fixative, formaldehyde prevents tissue autolysis by binding to protein. The most common reaction is with amino side-groups of amino acids. Stabilization of proteins is accomplished by the formation of intermolecular and intramolecular bonds. Reaction with a single amino group produces an unstable intermediate methylol compound. Cross-linking of adjacent amino acid chains can occur by the formation of meth-

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ylene bridges, resulting in more stable compounds. In general though, the reactions between formaldehyde and proteins are reversible and the reaction products are unstable.[8]

Post-pulpotomy, formaldehyde has been shown to accumulate in the pulp and dentin, and to diffuse through dentin and cementum, leading to detectable levels in the periodontal ligament and periapical bone.[9-12] Numerous studies indicate that formocresol causes irritation and has toxic effects on connective tissue.[13-20]

Adverse effects on the succedaneous permanent tooth resulting from formocresol pulpotomy have been reported, but most investigators felt that there was no relationship between pulpotomy and tooth defects.[21-24] Reports that indicate early loss of pulpotomized primary teeth conflict with those that show that there was no difference in the life span of primary teeth with or without pulpotomy.[25-27]

Evidence suggests that a 1:5 formocresol dilution has:

- ☐ Tissue effects.[14,15,28]
- ☐ Clinical effects in animal models.[29,30]
- ☐ Clinical success in humans similar to the effects of full-strength formocresol.[25,26]

The laboratory and clinical data were the basis for the recommendation that the 1:5 formocresol dilution be used for pulpotomy procedures.[26]

Formocresol, from pulpotomy sites, has been shown to be distributed systemically.[12,31,] Tissue changes have occurred in various internal organs, particularly the kidney and liver, in studies that have used intravenous injection or pulpotomies as the routes of administration.[32-36] Although some of the dosages far exceeded those used clinically, the quantity of circulating formaldehyde was found to increase with the number of teeth treated.[33,34] Despite the fact that laboratory animals were used, the results suggested a potential for systemic damage in a human population.

The ability of formaldehyde to elicit an immune response has been demonstrated by a number of investigators.[37-40] Although there has been an indication that sensitization from clinical use could result, most studies suggested that moderate clinical application of the formocresol pulpotomy did not cause a significant reaction.[41-44]

Formaldehyde has been shown to be a mutagen and evidence suggests that it is a carcinogen.[45,46] Reviews on these topics were provided by Lewis and Chestner, and Squire and Cameron.[6,49] Because of the potential risk to humans, the rationale for dental use of a mutagenic and carcinogenic drug such as formaldehyde has been questioned.[47]

The current objectives of the formocresol pulpotomy would seem to be solely clinical, that is, to maintain the tooth in an asymptomatic condition until normal resorption and exfoliation occur. Despite a high clinical success rate, considerations about its toxic, immunogenic, mutagenic, and carcinogenic effects, have led investigators to seek alternatives to formocresol as a medicament during the pulpotomy procedure in primary teeth.

Surveys in 1965 and 1968 found that full-strength formocresol was preferred by teaching institutions in North America.[48,49] A 1973 study indicated that calcium hydroxide was preferred in Scandinavia as the medicament to be used during a pulpotomy procedure.[50]

MATERIALS AND METHODS

A survey was sent to all members of the Canadian Academy of Pediatric Dentistry as listed in the 1987 membership roster (105 members), in order to evaluate the use of and attitudes toward various medicaments and techniques that are now used in the course of pulpal therapy, on vital human primary teeth.

A survey was also sent to all heads of departments of Pediatric Dentistry of Dental Schools in Canada, the United States and selected Dental Schools throughout the world (209 schools). This was done to evaluate use of and attitudes toward the medicaments and techniques now taught with respect to pulpal therapy on vital human primary teeth, in educational institutions. The results of the surveys were tabulated and analyzed.

RESULTS

Survey of Canadian pediatric dentists

The first questionnaire was sent to 105 members of the Canadian Academy of Pediatric Dentistry. Seventy members replied, a response rate of 66.7 percent.

Ninety-four percent (94 percent) of respondents agreed with the statement "The vital pulpotomy technique is indicated in those primary teeth in which the pulp is cariously exposed but remains vital". Two respondents suggested that "mechanical exposure" should also be included in the statement.

Ninety-three percent (93 percent) of respondents agreed with the statement "The vital technique is contraindicated in those teeth with nonvital necrotic pulps, gross loss of root structure, excessive mobility, presence of a draining fistula, pathological involvement of the furcation area, and where pulpal amputation results in signs of hyperemia". One respondent stated that, in

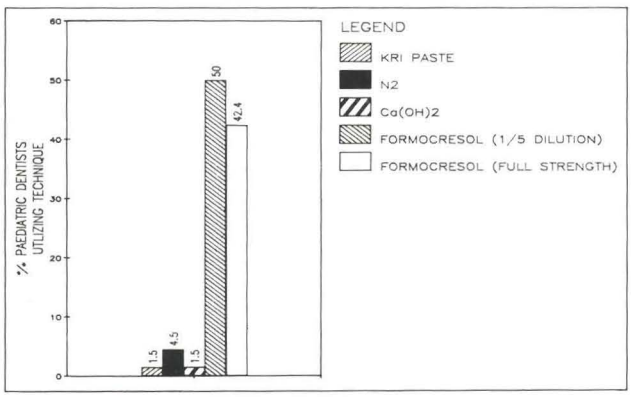

Figure 1. Preferred pulpotomy technique (Canadian pediatric dentists n = 66).

his practice, the same 'vital' procedure was used for all of the above situations with consistently good results.

Of those who responded, sixty-six of seventy (94.3 percent) indicated that they practiced a pulpotomy technique on vital primary teeth. Four respondents (5.7 percent) indicated they used pulpectomy routinely, i.e. did not perform pulpotomies at all.

Of the sixty-six who indicated they used a pulpotomy technique, the preferred medicament was the 1:5 formocresol dilution (Figure 1).

Altogether, 92.4 percent of the pediatric specialists used either the 1:5 dilution or the full-strength formocresol.

The relation between the preferred technique and number of years the dentist was in practice is shown in Table 1.

All of the respondents, regardless of the preferred medicament, indicated that the pulpotomy technique was completed in one appointment. The full-strength formocresol and 1:5 formocresol dilution were left on pulpal tissue for three to five minutes by 67.8 percent and 78.8 percent of the practitioners, respectively. Calcium hydroxide, N2 and Kripaste were left in permanent contact with the pulpal tissues by all practitioners who used these materials.

Of the twenty-eight pediatric specialists who utilized full-strength formocresol, twenty-six (92.9 percent) estimated a clinical success rate of greater than 80 percent. All practitioners using the 1:5 formocresol dilution (100 percent) estimated a success rate of over 80 percent.

Thirty-three of the sixty-six (50 percent) of the pediatric specialists who utilized a pulpotomy technique indicated that they had concerns about harmful effects of the medicament. Of the practitioners who preferred full-strength formocresol, 39.3 percent expressed con-

Table 1 ☐ Years in practice vs preferred technique (pediatric dentists).

	Years in practice			
Preferred technique	1-5	6-10	11-15	>15
Formocresol (full strength)	10%	33.3%	45.5%	53.6%
Formocresol (1:5 dilution)	90%	42.9%	45.5%	35.7%
Ca(OH)2			9.0%	
N2				10.7%
Kripaste		4.8%		
Pulpectomy		19%		
	100% (n=10)	100% (n=21)	100% (n=11)	100% (n=28)

Table 2 ☐ Specific concerns regarding undesirable effects of preferred pulpotomy technique (pediatric dentists).

	Specific concerns regarding technique					
Preferred technique	Local tissue effects	Systemic effects	Public response	Odor	Not indicated	
Formocresol (full strength)	33.3%	42.9%	14.3%	4.8%	4.8%	(n=21)
Formocresol (1:5 dilution)	15.2%	57.6%	24.2%		3.0%	(n=33)
Kripaste	100%					(n=1)

Table 3 ☐ Attitude of Canadian pediatric dentists regarding change in preferred pulpotomy technique.

	Considering change in technique? (%)			
Preferred technique	Yes	No	Uncertain	
Formocresol (full strength)	28.6	50	21.4	(n=28)
Formocresol (1:5 dilution)	12.1	45.5	42.4	(n=33)
Ca(OH)2		100		(n=1)
N2	33.3	66.7		(n=3)
Kripaste	100			(n=1)
	n=14	n=32	n=20	(n=66)

Table 4 ☐ Relationship between current pulpotomy technique and proposed new pulpotomy technique (pediatric dentists).

	Considering change to:					
Current preferred technique	1/5 f.c.*	g.a.**	Ca(OH)2	pulpectomy	ZOE	
Formocresol (full strength)	25%	37.5%	25%	12.5%		(n=8)
Formocresol (1:5 dilution)		75%			25%	(n=4)
N2		100%				(n=1)
Kripaste		100%				(n=1)
	n=2	n=8	n=2	n=1	n=1	(n=14)

(*f.c. = formocresol; **g.a. = glutaraldehyde)

Table 5 ☐ Response rate by region (dental schools).

Canada: 90% (9/10)	Central/South America: 27.3% (6/22)
United States: 81.1% (60/74)	Middle East/Africa: 70% (7/10)
Great Britain: 90% (9/10)	Far East/Japan: 36.4% (8/22)
Australia/New Zealand: 71.4% (5/7)	Continental Europe: 26.2% (11/42)
Scandinavia: 83.3% (10/12)	

Table 6 ☐ Preferred pulpotomy technique by geographic region (dental schools).

Geographic region	Preferred technique, and % of schools in each region using the technique		
Canada:	1:5 dilution formocresol	55.6	(5/9)
United States:	full strength formocresol	48.3	(29/60)
Great Britain:	full strength formocresol	44.4	(4/9)
Australia/New Zealand:	1:5 dilution formocresol	60.0	(3/5)
Scandinavia:	calcium hydroxide	70.0	(7/10)
Central/South America:	1:5 dilution formocresol	50.0	(3/6)
Middle East/Africa:	full strength formocresol	42.9	(3/7)
Far East/Japan:	full strength formocresol	37.5	(3/8)
Europe:	full strength formocresol	36.4	(4/11)

Table 7 ☐ Second most popular pulpotomy technique by geographic region.

Geographic region	Pulpotomy technique, and % of schools in each region using the technique		
Canada:	full strength formocresol	44.4%	(n = 4/9)
United States:	1:5 dilution formocresol	45.0%	(n = 27/60)
Great Britain:	1:5 dilution formocresol	22.2%	(n = 2/9)
Australia/New Zealand:	full strength formocresol	20.0%	(n = 1/5)
	and Kripaste/Ledermix	20.0%	(n = 1/5
Scandinavia:	full strength formocresol	10.0%	(n = 1/10)
	and paraformaldehyde/iodoform	10.0%	(n = 1/10)
	and Ledermix	10.0%	(n = 1/10)
Central/South America:	full strength formocresol	33.3%	(n = 2/6)
Middle East/Africa:	1:5 dilution formocresol	14.3%	(n = 1/7)
	and glutaraldehyde	14.3%	(n = 1/7)
	and calcium hydroxide	14.3%	(n = 1/7)
	and paraformaldehyde	14.3%	(n = 1/7)
Far East/Japan:	calcium hydroxide	25.0%	(n = 2/8)
Europe:	1:5 dilution formocresol	27.3%	(n = 3/11)

Table 8 ☐ Specific concerns regarding preferred pulpotomy technique (dental schools).

Preferred technique	Concerns: (% of total for medicament) local tissue effects	systemic effects	public response	other	
f.c. (full strength)	39.3	49.2	9.8	1.6*	n = 61
f.c. (1:5 dilution)	31.9	44.7	23.4		n = 47
Ca(OH)2	42.9	28.6	14.3		n = 7
glutaraldehyde	40	40	20		n = 5
paraformaldehyde(N2)	33.3	33.3	33.3		n = 3
ZOE	100				n = 1
paraformaldehyde/iodoform	100				n = 1
Kripaste/Ledermix				100**	n = 1
					total n = 126

(* "the fact that the material and methods seem rather empirical and old fashioned"
** "staining of teeth")

Table 9 ☐ Attitude of dental schools ragarding change in preferred pulpotomy technique.

Preferred technique	Considering a change in technique? (%) Yes	No	Uncertain	
f.c. (full strength)	45.1	45.1	9.8	(n = 51)
f.c. (1:5 dilution)	24.4	71.1	4.4	(n = 45)
Ca(OH)2	7.7	84.6	7.7	(n = 13)
Glutaraldehyde		62.5	37.5	(n = 8)
Paraformaldehyde (N2)	33.3	66.7		(n = 3)
ZOE			100	(n = 2)
Paraformaldehyde/iodoform			100	(n = 1)
Kripaste/Ledermix	100			(n = 1)
Ledermix			100	(n = 1)
	n = 37	n = 73	n = 15	(n = 125)

Table 10 ☐ Relationship between current pulpotomy technique and proposed new technique (dental schools).

Current preferred technique	Percent of schools considering change to: 1:5 f.c.	g.a.	Ca(OH)2	Pulpectomy	Other	
Formocresol (full strength)	34.8	43.5	4.3	4.3	13*	(n = 23)
Formocresol (1/5 dilution)		72.7	9.1		18.2**	(n = 11)
Ca(OH)2					100***	(n = 1)
Paraformaldehyde (N2)		100				(n = 1)
Kripaste/Ledermix		100				(n = 1)
	n = 8	n = 20	n = 2	n = 1	n = 6	(n = 37)

(*one reply each indicated cryocoagulation, electrosurgery and Fe2SO4
**one reply indicated pressure alone and one indicated an even less concentration
***one reply indicated a partial pulptomy)

cern regarding potential undesirable effects; 63.6 percent who preferred the 1:5 formocresol dilution and the practitioner who used Kripaste also indicated concerns about the use of these medicaments. The dentists who used calcium hydroxide and N2 had no concerns regarding their techniques. The specific concerns regarding undesirable effects of the pulpotomy medicaments are shown in Table 2.

The dentists were asked whether, based on recent research, they were considering a change in the preferred pulpotomy technique. Fourteen of the sixty-six (21.2 percent) indicated that they were thinking of adopting a different pulpotomy technique; thirty-two (48.5 percent) indicated that they were not considering a change; and twenty (30.3 percent) admitted that they were uncertain as to whether or not they would change their technique (Table 3).

Of the 21.2 percent of pediatric dentists who indicated they were considering a change in technique, the new medicament being considered in the majority of cases (eight of fourteen, or 57 percent) was glutaraldehyde (Table 4). Of the pediatric dentists who indicated that they were uncertain about a change in technique, 65 percent indicated that an endorsement by scientific and/or research groups would be necessary for them to make a change, and 35 percent indicated that an endorsement by national dental bodies would be required.

Survey of dental schools

The second questionnaire was sent to 209 dental schools worldwide; 125 surveys were returned (response rate of 59.8 percent). This was broken down by region in Table 5.

Ninety-one percent (91 percent) of the respondents agreed with the statement, "The vital pulpotomy technique is indicated in those primary teeth in which the pulp is cariously exposed but remains vital."

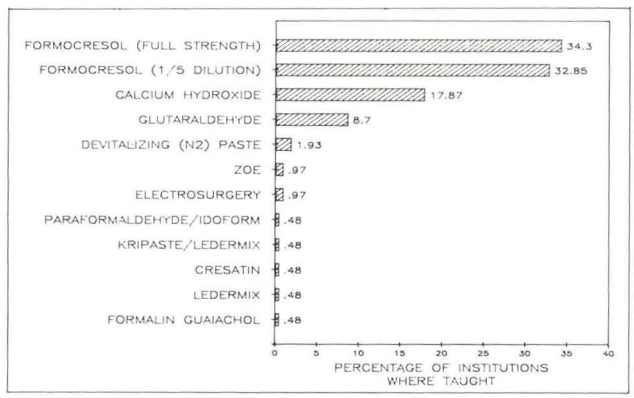

Figure 2. Pulpotomy techniques (taught by dental schools n = 207).

Ninety-six percent (96 percent) of the respondents agreed with the statement, "The vital technique is contra-indicated in those teeth with nonvital necrotic pulps, gross loss of root structure, excessive mobility, presence of a draining fistula, pathological involvement of the furcation area, and where amputation results in signs of hyperemia".

All responding schools (100 percent) indicated that they taught a pulpotomy technique for the treatment of vital primary teeth, to undergraduate and/or postgraduate students.

A breakdown of all of the pulpotomy techniques (n = 207) that are taught is given in Figure 2. Of the eighteen schools using the glutaraldehyde technique, ten (55.56 percent) used a 2 percent concentration; three (16.67 percent) used a 2.5 percent concentration; two (11.11 percent) used a 4 percent concentration; and three (16.67 percent) used a 5 percent concentration.

The breakdown of the preferred pulpotomy technique of the responding schools is shown in Figure 3.

The most popular and the second most popular pulpotomy techniques by geographic region are shown in Tables 6 and 7, respectively.

When asked the number of appointments taken to complete the preferred pulpotomy technique, 98 percent of the schools that preferred full-strength formocresol indicated that one appointment was needed. One appointment was also indicated by 97.8 percent of those who preferred the 1:5 formocresol dilution, 92.3 percent of those who used calcium hydroxide, and 100 percent of those who preferred glutaraldehyde.

Of the schools preferring these medicaments, full-strength formocresol, 1:5 dilution formocresol, and glutaraldehyde, were left on the pulpal tissue for five minutes during the pulpotomy procedure by 84.3, 77.8 and 62.5 percent, respectively. All those schools that preferred calcium hydroxide, indicated that the material remained on the pulp permanently.

The clinical success of the preferred pulpotomy technique was estimated to be greater than 80 percent by 96.1 percent of the full-strength formocresol users, 95.6 percent of the 1:5 formocresol dilution users, 92.3 percent of the schools that prefer calcium hydroxide, and 100 percent of those that prefer glutaraldehyde.

Of the 125 responding schools, sixty-nine (55.2 percent) indicated concern about undesirable effects attributable to the preferred technique. The specific concerns noted regarding the preferred techniques can be seen in Table 8. Of the schools that preferred full-strength formocresol, 62.7 percent expressed concern about potential undesirable effects; 57.8 percent of the schools that preferred the 1:5 dilution, 25 percent of those who used glutaraldehyde, and 38.5 percent of the calcium hydroxide users also indicated concerns about the use of these medicaments.

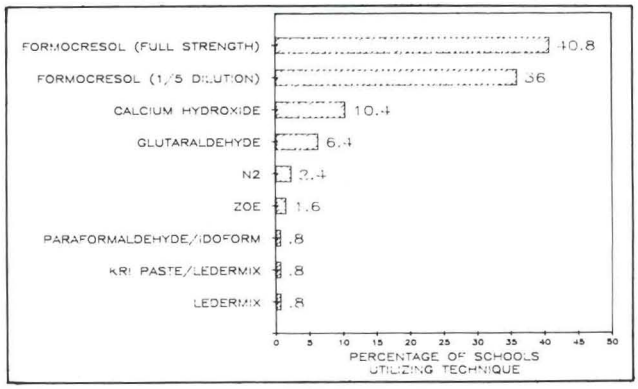

Figure 3. Preferred pulpotomy technique by dental schools (n = 125).

The dental schools were asked whether, based on current research, they were considering a change in the preferred pulpotomy technique. Thirty-seven of the 125 schools (29.6 percent) indicated that they were thinking of changing; seventy-three (58.4 percent) indicated that they would not change techniques; and fifteen (12 percent) indicated that they were uncertain, regarding the future of their preferred pulpotomy technique. Of the schools that preferred full-strength formocresol, 45.1 percent indicated they were considering a change, and 24.4 percent of those that preferred the 1:5 dilution were considering a change in technique (Table 9).

Of the thirty-seven schools that indicated that they would change their current pulpotomy technique, twenty (54.1 percent) indicated that glutaraldehyde would be the new medicament of choice (Table 10).

DISCUSSION

The high response rate (66.7 percent) to the questionnaire sent to pediatric dental specialists indicated a strong interest in medicaments and their use as they apply to the pulpotomy technique for vital primary teeth.

The overwhelming agreement by both the pediatric specialists and the dental schools with the basic indications and contraindications for pulpotomy, suggested that appropriate care was taken in tooth selection.[51] Comments accompanying the returned surveys indicated that both groups realized that proper diagnosis played a key role in the success of the technique.

A majority of those in practice for less than five years favored the 1:5 dilution (90 percent). The percentage of specialists favoring the full-strength formocresol increased with the number of years that they had been in practice: 53.6 percent of those in practice for over fifteen years used the full-strength solution. Since the use of diluted formocresol had been advocated only from the mid-1970s, the pediatric dentists seemed re-

luctant to adopt techniques that were different from those that they had been taught. Those practitioners who had been in practice for over fifteen years, and used the 1:5 dilution (35.5 percent), may have been persuaded by the weight of evidence regarding effectiveness of the lesser dilution.

The preferred technique was always completed in one appointment, regardless of the material used. The majority of specialists agreed with the research that indicated that application of formocresol for more than five minutes was not necessary to increase treatment success. Those who applied the formocresol for less than three to five minutes may have been attempting to decrease tissue exposure to the medicament because of good success rates with this application time in their practices; or they may have been reacting to perceived harmful effects of longer applications.

It is interesting to note that 63.6 percent of those who used the 1:5 formocresol dilution had concerns about harmful effects, whereas 39.3 percent of those who used full-strength formocresol were concerned with potential harmful effects of their medicament. This may be because those who used the diluted solution chose it because they were familiar with the literature, which, as well as indicating a good success rate, also highlighted the controversy with regard to the potential adverse effects of formocresol. The concern rate among those practitioners who utilized the formocresol medicaments seemed surprisingly low in light of the volume of literature that examined adverse effects of formocresol. As some of the specialists' comments accompanying the returned surveys indicated, however, the clinical significance of the research was in question. On the other hand, others were adamant in stating their concerns about formocresol, pointing out that they no longer used the pulpotomy, and have switched to a pulpectomy technique.

When formocresol pulpotomies were considered, the most frequently voiced concern was that of potential systemic effects. Local tissue effects and the concern over public response to scientific research on the topic were the second most prevalent concerns among full-strength and 1:5 dilution users, respectively. Local and systemic tissue effects, have been investigated and are well documented. Some practitioners may have been concerned about proposed labelling legislation, and the reaction of the public to a toxic medicament used in dental procedures.

Although 50 percent of practitioners were concerned with the potentially harmful effects of their medicament of choice, only fourteen of sixty-six (21.2 percent) considered changing their pulpotomy technique. Twenty of sixty-six (30.3 percent) were uncertain about future plans for their technique (Table 3). A change of technique was considered by only 28.6 percent and 12.1 percent of those using full-strength and the 1:5 formocresol dilution, respectively (Table 3). The majority (65 percent) stated that an endorsement by scientific or research groups would be necessary, in order for those who were uncertain to change from their preferred technique. Although there were many studies regarding alternatives to formocresol as the traditional North American pulpotomy medicament, it may be assumed that the evidence provided has not been persuasive enough to convince most Canadian pediatric specialists to change.

Regardless of the currently preferred technique, in cases where a decision was made to change the technique, most practitioners (eight of fourteen, or 57 percent) thought of glutaraldehyde as an alternative (Table 4). Other alternatives considered by the current full-strength formocresol users were, the 1:5 dilution, calcium hydroxide, and pulpectomy. The latter two each had contemporary support for their use.[52-55] It was surprising that one of the current users of the 1:5 dilution of formocresol was considering zinc-oxide eugenol (ZOE) as an alternative pulpotomy medicament, when evidence to support its effectiveness was lacking.

The overall response of 59.8 percent to the dental school surveys was considered to be very good, particularly when language differences and postal barriers were considered. The response rate from Canada, United States, Great Britain and Scandinavia was over 80 percent, and the response rate from Australia and the Middle East/Africa was 70 percent or more. This paralleled the high degree of interest shown by the pediatric specialists in the first survey.

There was a tremendous variation in medicaments used by the dental schools. A total of twelve different techniques was reported. The preferred technique on a worldwide basis, was full-strength formocresol (40.8 percent) This was followed by the 1:5 dilution of formocresol (36 percent); calcium hydroxide (10.4 percent); and glutaraldehyde (6.4 percent) (Figure 2).

Combined results from Canada and the United States showed that 47.8 percent of the schools preferred full-strength formocresol, and 46.4 percent preferred the 1:5 dilution of formocresol. The overall use of formocresol in Canada and the United States, therefore, was 94.2 percent. Stone and Hink, using responses from twelve North American dental schools in 1965, found that eight (66.7 percent) used full-strength formocresol in their pulpotomy technique, two (16.7 percent) used calcium hydroxide, one (8.3 percent) used zinc-oxide eugenol, and one (8.3 percent) did not perform pulpotomies at that time.[48] Spedding surveyed fifty-six Canadian and American dental institutions in 1968 and found that 60.8 percent used Buckley's formocresol,

30.4 percent used calcium hydroxide, and 5.1 percent used zinc-oxide eugenol.[49] It became evident that North American schools had almost universally adopted formocresol as the pulpotomy medicament of choice. The vast majority of research into pulpotomy medicaments (particularly in North America) has revolved around formocresol. The sheer volume of studies may have kept this material foremost in the minds of those teaching pulpotomy techniques.

Scandinavia was the one region that indicated that formocresol was not preferred technique. Seventy percent of the schools reported that they favored the use of calcium hydroxide. This was understandable since most of the research supporting this technique was conducted in Scandinavia. In 1973, Punwani and Molven also disclosed that the majority of Scandinavian dental schools preferred calcium hydroxide for use in their pulpotomy technique.[50]

All of the more popular techniques, (full-strength formocresol, 1:5 formocresol dilution, glutaraldehyde, and calcium hydroxide) were usually completed in one appointment, in accordance with accepted basic principles. The application time to the pulp was most frequently five minutes for both formocresol strengths as well as for glutaraldehyde, although individual variations were noted.

Just over half (55.2 percent) of the respondents had concerns regarding their preferred technique. This percentage again seemed low in light of the number of studies highlighting potentially adverse effects of the medicaments (formocresol in particular). As with the pediatric specialists, comments accompanying the returned surveys indicated that the clinical significance of many of the studies was being questioned.

The schools that indicated specific concerns about formocresol focused mainly on potential systemic effects (Table 8). Glutaraldehyde users were evenly divided between local and systemic concerns. Schools that used calcium hydroxide seemed to be primarily concerned with its local effects.

Of the institutions that preferred full-strength formocresol, 45.1 percent were actually considering a change in technique; only 24.4 percent of those that used the 1:5 formocresol dilution were considering a change (Table 9). Most of the group that had decided to change their technique (twenty of thirty-seven, or 54.1 percent), favored glutaraldehyde as the alternative medicament (Table 10). As with the pediatric dentists, it may be assumed that the evidence provided has not been persuasive enough to convince most of the teaching institutions currently using formocresol as the pulpotomy medicament of choice that there is currently a safe, effective alternative.

Of all the alternatives of formocresol, glutaraldehyde has been the most widely studied. Glutaraldehyde was first mentioned in relation to pulpal treatment by Hannah, when it was mixed with calcium hydroxide and used as a pulpotomy medicament in permanent human teeth.[56] S'Gravenmade and Wemes introduced glutaraldehyde as a material that could be used as a substitute for formaldehyde in endodontic treatment.[57,58] Glutaraldehyde was suggested specifically as an alternative to formocresol for use in pulpotomy procedures by a number of investigators.[59-61] Characteristics that have been used to justify its use include:

- ☐ It is a more active fixative agent, and more rapidly forms cross-linkages that would result in a more limited tissue penetration.[59,62]
- ☐ The zone of infiltration is more restricted after it is applied to exposed pulps.[59,63]
- ☐ There is less apical damage and less necrosis.[20,59]

Although destructive tissue reactions to glutaraldehyde will occur, they are generally much less intense than with formocresol.[64-67] Mild humoral and cell-mediated immune responses to glutaraldehyde have been noted.[43,65] Even though diffusion out of the pulp chamber was found to be less than with formaldehyde, Myers *et al* have shown that systemic absorption and distribution of glutaraldehyde will occur from pulpotomy sites.[10,68,69]

Interest has been shown in enriched collagen solutions, which have a beneficial effect on the healing process of a variety of wounds. Preliminary studies have been promising with regard to pulpal effects.[70,71]

Electrosurgery has been recommended as a means of undertaking a pulpotomy technique, because of a reduced operative time, and because its effects were self-limiting and without systemic involvement.[72] Good histological results were reported in animals where electrocoagulation was done after the coronal pulp had been amputated with rotating burs and spoon excavators. Sheller and Morton found, in a human histological study, that the electrosurgical pulpotomy was not superior to formocresol.[73] Shulman *et al* showed that when the entire coronal pulp was removed with electrosurgery in monkey primary teeth, irreversible pulpal degeneration occurred.[74]

Rather than risk the possibility of adverse effects due to pulpotomy medicaments, a pulpectomy has been suggested by some as the treatment of choice in primary teeth with an exposed vital pulp.[55]

SUMMARY AND CONCLUSIONS

Surveys were sent to all Canadian pediatric dental specialists and to Heads of Departments of Pediatric Dentistry of selected dental schools throughout the world, in order to determine the use of and attitudes toward

pulpal techniques on vital primary teeth.

The preferred pulpotomy medicament of Canadian pediatric dental specialists was the 1:5 formocresol dilution, which was used by 50 percent of the respondents. The second most prevalent medicament was full-strength formocresol, used by 42.2 percent of respondents. The most prevalent medicament utilized in pediatric dental departments of dental schools was full-strength formocresol (40.8 percent) followed in popularity by the 1:5 formocresol dilution (36 percent). Scandinavia was the only geographic region to deviate from formocresol as the preferred pulpotomy medicament. Seventy percent (70 percent) of the pediatric dental departments in Scandinavia preferred calcium hydroxide for pulpotomies.

Although 50 percent of the pediatric dental specialists and 55.2 percent of pediatric dental departments expressed concern about harmful effects of the preferred pulpotomy medicament, only 21.2 percent of the dentists and 29.6 percent of the schools were contemplating a change to another material.

Because of its long history and lasting popularity, formocresol has been the most widely studied of the many pulpotomy medicaments. Although other techniques have been proposed and studied, the vast majority of pediatric dental practitioners in Canada (92.4 percent) and dental schools worldwide (76.8 percent) utilize either the full-strength or the 1:5 dilution of formocresol as the preferred pulpotomy medicament for vital primary teeth.

It would seem that there is some question with respect to the relevance of the literature pertaining to adverse effects of the most widely used pulpotomy medicament (formocresol) as applied clinically to a pediatric dental population. There is also an indication that the state of current research on alternate medicaments was not sufficient to convince the majority of pediatric specialists or teaching institutions that a satisfactory alternative has yet been developed.

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Fetal alcohol syndrome and the realities of our time

Clinic

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"If only I had known!" This lament is—all too often—the final epitaph for many a human tragedy. In our current world of excesses, the additional "few" alcoholic drinks seems almost benign. But even one-to-three drinks a day that the mother consumes during the first two months of pregnancy can result in brain damage for the developing fetus. Yet, one in six women of childbearing age drinks enough alcohol to present a hazard to a developing fetus—often before the woman is aware that she is pregnant.[1]

The occurrence of fetal alcohol syndrome (FAS) is well documented in the professional literature, but is probably recognized only minimally by the general public. (How effective have we been in reaching the general public about the tragedies that drinking-and-driving brings on our highways?)

Although some states (including New York and California) require liquor stores and bars to post warnings linking drinking during pregnancy to the tragedies of birth defects, more than 5,000 babies are born annually in the United States with FAS. And the reality is that given the continuing drinking habits of young American women, there is little likelihood that this ongoing disaster for young children, their families and the nation will change in the near future.

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FETAL ALCOHOL SYNDROME: WHAT IS IT?

Historic reviews and case reports abound in the professional literature.[2-4] The classic symptoms are dutifully listed, including:

- ☐ Prenatal and/or postnatal growth retardation.
- ☐ Involvement of central nervous system with neurologic abnormalities, developmental delay, or intellectual impairment.
- ☐ Facial birth defects.
- ☐ Microcephaly, microphthalmia, poorly developed philtrum (the distance between the base of the nose and the upper lip), thin upper lip and/or flattening of the maxillary area.[2]

The worldwide incidence of FAS is 1.9 per thousand live births. Mental retardation is a cardinal feature of FAS and the latter is recognized as the leading cause of mental retardation in the Western world.[5] In the United States, a conservative estimate of the economic costs associated with FAS is $321 million per year. FAS-related mental retardation may account for as much as 11 percent of the annual cost for all mentally retarded institutionalized residents in the United States.[5] —"If only we had known."

SOME REALITIES

Pregnant women, who are identified as having alcohol related problems, "...should be referred to alcohol treatment centers for additional counseling and support."[2] Such advice seems and is sound. Unfortunately, in many instances, it does not provide for the realities of our times. For example:

- ☐ In the general population, almost a quarter of women with live births do not receive prenatal care in the first trimester of their pregnancy.
- ☐ Almost 40 percent of American Indian and black pregnant women do not receive prenatal care in the first trimester.
- ☐ Over 40 percent of Mexican American and Puerto Rican women do not receive prenatal care in the first trimester (Table 1).
- ☐ During the 1980s, there has been no change in the percent of pregnant women who received prenatal care in the first trimester (76 percent); or first received care either in their third trimester or no care prior to delivery (approximately 5 percent) (Table 2).
- ☐ Since the mid-1970s, there have been minimal changes in the percent of women between twelve and twenty-five years of age who consumed alcohol in the past month (Table 3).

Table 1 ☐ Percent of mothers with live births who did not receive prenatal care during the first trimester of pregnancy: 1985.[7]

Race	Percent
White	20.6%
Black	38.2
American Indian	39.7
Asian and Pacific Islander	25.0
Hispanic (any race)	38.8
Mexican American	40.1
Puerto Rican	41.7
Total	23.8%

Table 2 ☐ Percent of mothers with live births who began their prenatal care in either 1) the first trimester, or 2) the thrid trimester or had no prenatal care: selected years, 1970-1985.[7]

Year	First Trimester	Third Trimester or no prenatal care
1970	68.0%	7.9%
1980	76.3	5.1
1981	76.3	5.2
1983	76.2	5.6
1985	76.2	5.7

Table 3 ☐ The percent of young women who consumed alcohol in the past month: selected years 1974-1985.[6]

Age	1974	1976	1979	1982	1985
12-17 yrs.	29%	29%	36%	27%	28%
18-25 yrs.	–	58	68	61	64

Table 4 ☐ Alcohol consumption by women eighteen years of age and older: selected years 1971-1985.[6]

Amount*	1971	1975	1979	1985
Abstain	41%	45%	40%	45%
Light	40	35	38	37
Moderate	13	15	18	15
Heavier	5	4	4	3

* Alcohol consumption status is defined in ounces of absolute alcohol (ethanol) consumed per day as follows: abstain, 0; light, .01 to .21; moderate, .22 to .99; heavier, 1.00 or more.

Table 5 ☐ Use of selected substances in the past month by young women: selected years 1974-1985.[6]

Substance	Age in years	1974	1976	1979	1982	1985
Cigarettes	12-17	24%	26%	–	13%	15%
	18-25	47	51	–	42	35
Marijuana	12-17	11	11	14	10	11
	18-25	–	19	26	19	17
Cocaine	12-17	–	–	–	1.5*	1.0*
	18-25	–	–	–	4.7	6.3

* Relative standard error of more than 30 percent

☐ Since the early 1970s, there have been minimal changes in the percent distribution of women who are considered to be moderate and heavy consumers of alcohol (Table 4).

But, one to three drinks per day in the first two months of pregnancy can cause brain damage in the developing fetus. "If only we had known."*

Unfortunately, alcohol usage by young women is only part of the continuing consumption of items that can affect adversely the developing fetus. For example, of the women between eighteen and twenty-five years:

☐ More than 33 percent smoke cigarettes.
☐ At least 17 percent smoke marijuana.
☐ More than 6 percent use cocaine (Table 5).

OUTLOOK

Current treatment costs for FAS-related problems are about a hundred times federal funding for FAS research necessary to develop cost-effective, early-detection and prevention strategies.[5] We have been able to publicize mature programs in our schools and through the media for safe sex and condom use (once taboo subjects) to somehow control the spread of AIDS. Why not comparable programs relating to alcohol consumption and the damage to the developing fetus. It is just not good enough for gynecologist-obstetricians, pediatricians, and pediatric dentists to identify the problems, somehow hope to ameliorate the tragic results, and report the individual cases in the professional literature.

Why should my can of "Bud Light" not carry some sort of warning? Maybe pregnant women should learn that "life is not a beer commercial." Their lament need no longer be, "if only we had known." Fetal alcohol syndrome is a 100-percent preventable tragedy.

*As I prepare this material in mid-1989, I have been staring at an empty can of "Bud Light" beer. It is made of recyclable aluminum (I can get five cents back for it in New York State) and the printing on it tells me that "Anheuser Busch is the proud sponsor of the 1988 U.S. Olympic Team." (Yes, I know that that was quite some time ago, but it really takes me about two years to finish a six pack.) The label also informs me that the can contained 12 fluid ounces and that I consumed 108 calories, 8.8 grams of carbohydrates, 1.1 grams of protein and 0.0 grams of fat. (At least it helped keep my cholesterol level down.) But there is no indication of any alcohol content!

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ETHANOL AND THE NERVOUS SYSTEM

Alcoholism is associated with protean derangements of the central and peripheral nervous systems. Genetic factors and nutritional deficiencies play an important part in the genesis of these disorders, but virtually all the nervous system complications of alcoholism could be prevented by reducing or stopping the consumption of ethanol. The failure of Prohibition to eliminate alcoholism in the United States has shifted the burden of prevention from the legislative to the medical domain. Regrettably, the cause of alcoholism is still unknown, and its treatment remains unsatisfactory. Continued advances in our understanding of alcoholism and its neurologic complications offer hope that it may soon be possible to identify those who are at risk for alcoholism and to provide more effective therapies for those who are already affected.

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Cotton roll isolation versus Vac-Ejector® isolation

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Pit-and-fissure sealants are recognized as a proven preventive measure in pediatric dental patients.[1-5] They prevent decay by physically occluding caries susceptible areas of the occlusal surfaces of the teeth, thus protecting these areas from a cariogenic oral environment. The success of a sealant depends on its retention.

Application of sealant involves isolation of the tooth to be sealed, creation of microscopic mechanically retentive areas by etching, application of the sealant material, and curing the material. The success of this process is extremely sensitive to technique; the most critical step is isolation.[6-9] It has been clearly shown that any contamination of the etched tooth surface by saliva results in loss of retention of the sealant.[7-10]

Various methods of isolation are available; the rubber dam is generally considered ideal.[3,11] For several reasons, such as inadequately erupted teeth or discomfort caused by a clamp in nonanesthetized patients, this method is frequently not used. Cotton roll isolation is suggested in the literature as an acceptable alternative.[11]

The purpose of this study is to compare the retention of light-cured pit-and-fissure sealants placed using cotton roll isolation with those placed using the Vac-Ejector®* moisture control system. The Vac-Ejector® system consists of a bite block and rubber tongue shield that connect to the high speed evacuation line, providing a clear, dry field for operative procedures (Figure).

METHODS AND MATERIALS

Concise®**light-cured, white pit-and-fissure sealant was used in the study. A white material was chosen for ease of visual detection, immediately following application and at recall.

The sealant material was applied to 523 permanent molars in 145 children, ranging in age from five years, three months to ten years, four months, with a mean age of seven years, eight months. The majority of the children participating in the study attended second grade in the City of Richmond Public School System and qualified for the federally funded free-lunch program. A small number of participants were regular patients of the Richmond City Health Department Dental Clinics. Children in this age-range are excellent candidates for sealants, as most have recently erupted permanent first molars, highly susceptible to decay. Additionally, children of this age are usually cooperative for such elective, nontraumatic procedures.

Sealants placed in this study were applied at one of

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*Whaledent International, New York, NY.
**Dental Products/3M, St. Paul, MN.

the dental clinics of the Richmond City Health Department. Children of appropriate age were screened at their respective elementary schools by a pediatric dentist assisted by dental students from the Medical College of Virginia, School of Dentistry. Parental permission was obtained for all children chosen to participate in the study. Criteria for acceptance for this study included: (1) qualifying for the free lunch program, (2) properly executed parental consent form, (3) the presence of at least one adequately erupted, noncarious, permanent first molar with caries susceptible occlusal morphology. The eruptive status of a tooth was deemed adequate, if the occlusal surface was completely clear of gingival tissue and any amount of the facial and lingual tooth surfaces was visible above the marginal gingiva. The initial examination for caries lesions in teeth to be sealed was repeated, when the children presented at the dental clinic for application of the sealant.

All sealants were applied by an operator/assistant team. Three different operator/assistant teams were used: (1) a licensed pediatric dentist and assistant, (2) a licensed hygienist and assistant, and (3) one of approximately twenty senior dental students and assistant.

Procedures used in each of the four operatories utilized for the study were identical, with the exception of the isolation method to be employed. Two cotton roll isolation set-ups and two Vac-Ejector® set-ups were randomly distributed among the four numbered operatories. Operators and assistants were randomly assigned to operatories by drawing of numbers corresponding to operatory numbers.

When the children participating in the study arrived at the clinic, they were asked to draw numbers corresponding to the operatory numbers, and were thus randomly assigned to both the operatory/assistant team and the isolation method to be employed. Upon entering the operatories, the children were given a brief explanation of the procedure, any questions were answered and the procedure was started.

The previous oral screening examination was repeated to assure that the teeth to be sealed were not carious and otherwise met the criteria for the study. Following this examination, the occlusal surfaces of all teeth to receive sealants were cleaned with a dry pointed bristle brush in a slow speed handpiece. Next, isolation was achieved using either cotton rolls and a Dri-angle®† absorbent paper triangle placed in the cheek or the Vac-Ejector® and an absorbent paper triangle. The tooth was etched for sixty seconds using the 37 percent orthophosphoric acid gel supplied by the sealant manufacturer. The gel was applied with a camel-hair brush. The tooth was rinsed thoroughly for fortyfive seconds

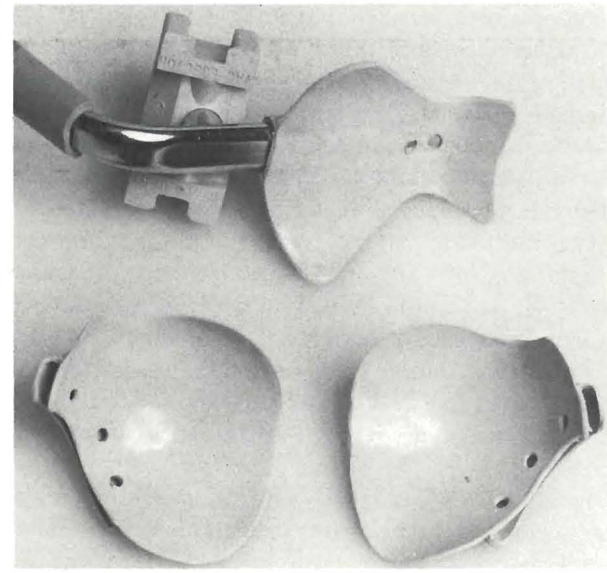

Figure. Vac-Ejector® isolation apparatus.

with water from the air-water syringe. The syringe was next used to dry the tooth until the occlusal surface became "frosty" in appearance. Isolation was maintained throughout this phase, and at no time was saliva allowed to contact the tooth. If contamination occurred, isolation was reestablished and the tooth was etched as described previously for a ten-second period.

Following evaluation of the etch, Concise® white sealant was painted onto the etched occlusal surface with the disposable brush tip and holder supplied by the manufacturer. The sealant was cured using a visible-light-curing unit for a thirty-second period, with the light-exit-window one to two millimeters from the sealant surface.

Following exposure to the light, the occlusal pits and fissures of the tooth were checked for complete coverage, utilizing a sharp #5 dental explorer.‡ Retention of the sealant was tested by vigorously attempting to displace the sealant from the tooth using the same explorer. If the sealant was displaced, the tooth was reisolated, reetched for sixty seconds and resealed according to the original protocol.

All permanent first molars that met the criteria were sealed, using the outlined procedure. At the completion of the visit, a letter for parents explaining that sealants were placed was sent with the children.

†Dental Health Products, Niagara Falls, NY.
‡Star Dental, Valley Forge, PA.

Patients were recalled in 9.3 months on average, but not before six months. Two examiners, who were unaware of the isolation method used, rated the sealants independently, utilizing a dental explorer and an intraoral mirror. A sealant rated as "completely retained" covered all pits and fissures on the occlusal surface of the tooth. "Partially retained" sealants were still present on the tooth, but some pits and fissures, or parts of fissures, were exposed, with no evidence of sealant. For teeth that were originally sealed, but with no evidence of sealant remaining, a "not retained" notation was made. When discrepancies in ratings occurred, the teeth in question were reevaluated by both examiners and an appropriate rating was agreed upon and recorded.

The data were compiled and evaluated to ascertain the overall retention of the sealants in teeth isolated with cotton rolls versus those placed in teeth isolated with the Vac-Ejector®. Variability in results among the three types of operator/assistant teams was also examined, in addition to that between maxillary and mandibular teeth in relation to the technique for isolation used. Tables were compiled to reflect data grouped accordingly. Statistical significance was determined among these data groupings, using a paired T-test to determine differences between full retention rates in the maxillary and mandibular arches and a two-way analysis of variance for other data groupings.

RESULTS

Table 1 shows that the majority of teeth were sealed by either a dentist or a student, the smallest number of teeth were sealed by a hygienist. More teeth were sealed utilizing cotton rolls than the Vac-Ejector®. A two-way analysis of variance comparing operator and retention rates revealed no statistically significant differences in results among the three operators on any teeth sealed ($p > 0.11$).

Further evaluation of the data, using two-way analysis of variance, revealed no statistically significant differences in retention rates, for any of the teeth examined, between the two techniques ($p > 0.50$). Table 2 reflects the data grouped in this manner.

When full retention rates for the individual teeth were examined without regard to technique of isolation, a statistically significant difference was found between arches. As indicated in Table 3, the full retention rate for mandibular teeth was significantly higher than for maxillary teeth ($p < 0.0001$).

Table 1 ☐ Total number teeth sealed.

Operator	Isolation method: Cotton rolls	Vac-ejector	Totals
Dentist	135	67	202
Hygienist	28	13	41
Student	172	108	280
Totals	335	188	523

Table 2 ☐ Retention rates by isolation method.

Tooth	Fully retained: Cotton roll	Fully retained: Vac-eject	Partially retained: Cotton roll	Partially retained: Vac-eject	Not retained: Cotton roll	Not retained: Vac-eject
3	65.5%	70.0%	20.2%	8.0%	14.3%	22.0%
14	72.2%	60.0%	18.4%	17.8%	9.4%	22.2%
19	86.9%	93.6%	3.6%	0.0%	9.5%	6.4%
30	89.9%	87.0%	2.5%	2.2%	7.6%	10.8%

Table 3 ☐ Retention rates by tooth.

	Tooth	Fully retained	Partially retained	Not retained
Maxillary	3	67.2%	15.7%	17.1%
	14	68.4%	18.0%	13.6%
Mandibular	19	89.3%	2.3%	8.4%
	30	88.8%	2.4%	8.8%

DISCUSSION AND CONCLUSIONS

This study demonstrated that the retention of a light-cured, white pit-andfissure sealant was not significantly affected by the method of isolation. The study also showed that either isolation method worked equally well in the hands of dentists, dental students and a hygienist. Ferguson and Ripa showed that sealants applied by either dental students or dentists are equally retained.[12]

The reevaluation period was less than a year. Rock suggested that if a sealant is lost as a result of an inadequate technique of application, it is lost relatively early, i.e. within six months following its placement.[13] The authors felt that the majority of failures caused by inadequate isolation should have been evident during the period of the study. Complete retention rates for the mandibular teeth were shown to be significantly higher than those for the maxillary teeth. This finding has been reported in other studies as well.[3,14]

The Vac-Ejector® method can serve as an alternative to isolation with cotton rolls for the application of pit-and-fissure sealants. In the authors' opinion, this method requires less operator effort than with cotton rolls. Because the parts of the Vac-ejector are not made of an

absorbent material, they do not retain or act as a wick for saliva. The components of the Vac-Ejector® are easily sterilized using cold sterilization in bacteriocidal liquids.

Further research with this method is indicated, to examine patient and operator preference, cost effectiveness, and the success rate of unassisted operators.

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SUBSTANCE USE AMONG EIGHTH-GRADE LATCHKEY CHILDREN

In spite of the strong findings that substance use is higher among eighth-grade students in self-care, a large proportion of those in self-care are not using these substances. A more detailed assessment using data collected from parents might help to determine specific parenting characteristics or self-care strategies that are protective. This could include more information concerning chores, calling to check in with parents when they arrive home, where they can and cannot go after school, and other limitations imposed by parents in their absence. These more authoritarian parent-monitoring styles have been suggested to be protective in other situations. It is possible that a lack of parental involvement in the child's activities is an underlying problem that becomes most pronounced in the self-care situation, leading eighth-grade students to express autonomy by using drugs.

In light of these findings, it is important to attempt to assess this issue in a broader social context and to anticipate the policy implications. There is little question that the number of children in self-care is likely to increase in the future. Although we cannot state from our data that this will cause an increase in substance use among these children, these data do suggest that an increase would be likely to be associated with self-care. In the absence of causal data, prudence would suggest that we need to develop strategies for safe and healthy self-care and alternatives to self-care for adolescents.

Richardson, J.L. *et al*: Substance use among eighth-grade students who take care of themselves after school. Pediatrics, 84:556-566, September, 1989.

The efficacy of rubber dam isolation in reducing atmospheric bacterial contamination

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The topic of cross-infection control in dentistry has recently received much media coverage particularly because of the advent of the human immunodeficiency virus and AIDS.[1,2] A great number of investigations have been performed to ascertain the means by which infection may spread within the surgery environment and to develop methods of obviating hazards of infection. For instance it is known that a chlorhexidine gluconate mouth wash before a scaling procedure would diminish airborne bacteria arising from the use of the ultrasonic scaler, similar to the use of high-volume aspiration, which exhausts externally during the use of an air turbine.[3,4] There are few data in the literature, however, on the efficacy of rubber dam isolation in reducing the number of airborne, infective particles; although it is generally accepted that this may indeed be the case. Hence, the aim of this study was to evaluate quantitatively the changes, if any, in atmospheric bacterial pollution, when conservative procedures are performed in two groups of pedodontic patients with and without rubber dam isolation.

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MATERIALS AND METHODS

The study was carried out in a surgery measuring twelve feet by fifteen feet in the pedodontic clinic at Glasgow Dental Hospital.

The subjects were twenty children (age-range, ten to fourteen years) who underwent routine conservative procedures under the care of one of us (JR). Throughout the study, conservative procedures were performed using an air-turbine-driven handpiece and high-volume aspiration with external venting. The test-group comprised ten patients fitted with rubber dam before the conservative procedure, and the control-group comprised ten patients who had no rubber dam isolation.

Airborne bacterial contamination was assessed by means of blood-agar (Oxoid Ltd., Basingstoke) settle plates, which were sited 1, 2 and 3 meters from the headrest of the dental chair. Before each experiment, preoperative or 'background' bacterial load was assessed by exposing the blood-agar plates to air for 10 mins. Fresh plates were then placed at identical positions and the operative procedure carried out to determine 'perioperative' bacterial counts. Obviously, the length of the operative procedure varied from 5-15 mins, depending on the extent of the cavity preparation, in the test-group as well as in the control-group. Data thus obtained were balanced, therefore, in a random

manner. Immediately after the conservative procedure, a third set of three plates was exposed to air for 10 mins to evaluate the postoperative bacterial contamination.

All plates were incubated aerobically at 37° C for 48h and the resultant number of colony-forming units (CFUs) represented the level of airborne bacterial content.

STATISTICAL ANALYSIS

The Mann-Whitney U test was used to evaluate the significant differences in colony-forming units obtained when the conservative procedures were performed with and without the rubber dam; and also to assess the changes, if any, in the preoperative, perioperative and postoperative bacterial contamination. This test is recommended for handling nonparametric test data from two independent samples within the same population.[5]

RESULTS

The variation in colony counts on the blood-agar, settle plates at different positions are shown in Table 1. The results were tested for statistical significance, using the Mann-Whitney U test; differences in significance between the test and control procedures at varying distances are shown in Table 2. There was no significant difference in the background bacterial counts, when preoperative and postoperative counts were compared at 1 m, 2 m or 3 m positions. There was a highly significant 88 percent reduction, however, in bacterial contamination perioperatively at 1 m position, when rubber dam was used ($p < 0.001$); at 2 m position, this figure dropped to 72 percent ($p > 0.05$); while at 3 m, no reduction in bacterial numbers was perceived.

Table 1 ☐ Variation of colony counts with distance and procedure.

Distance and procedure	Colony forming units (CFU) Preoperative Mean ± SE		Perioperative Mean ± SE		Postoperative Mean ± SE	
One meter						
with rubber dam+	1.8	0.6	1.4*	0.3	2.0	0.5
without rubber dam+	1.5	0.6	11.5*	4.9	2.1	0.4
Two meters						
with rubber dam	1.8	0.3	1.1	0.5	2.2	0.5
without rubber dam	2.0	0.5	3.9	0.8	2.0	0.5
Three meters						
with rubber dam	2.0	0.8	1.7	0.7	1.5	0.5
without rubber dam	1.4	0.5	1.6	0.3	1.5	0.6

SE, Standard error
* $p < 0.001$ (Mann Whitney U Test)
+ A total of ten patients each were studied for the test and control groups.

As shown in Table 2, significantly high bacterial counts were noted at 1 m position, when preoperative and perioperative, or perioperative and postoperative procedures without rubber dam isolation were compared.

The majority of the organisms cultured on blood-agar plates belonged to the Steptococcus viridans group as they elicited characteristic alpha hemolysis.[6] No attempts were made, however, to perform qualitative microbiological studies.

Table 2 ☐ The efficacy of reduction of bacterial contamination by rubber dam isolation.

Comparison of procedures	p value (Mann-Whitney U Test)		
With rubber dam vs without rubber dam			
	Pre-Op	Peri-Op	Post-Op
1 meter	NS	< 0.001	NS
2 meters	NS	NS	NS
3 meters	NS	NS	NS
Preoperative vs perioperative			
	With RD	Without RD	
1 meter	NS	< 0.001	
2 meters	NS	NS	
3 meters	NS	NS	
Preoperative vs postoperative			
	With RD	Without RD	
1 meter	NS	NS	
2 meters	NS	NS	
3 meters	NS	NS	
Perioperative vs postoperative			
	With RD	Without RD	
1 meter	NS	< 0.001	
2 meters	NS	NS	
3 meters	NS	NS	

NS, Not significant

DISCUSSION

Our results indicate that there is a highly significant reduction in the number of airborne bacteria, when rubber dam is used during conservative procedures, particularly in the vicinity of the operator and the dental assistant. This confirms the general concept that the rubber dam, in addition to its other properties such as improving safety and saliva control, reduces bacterial contamination of the atmosphere. The inhalation of aerosolized microbes could perhaps be considered as an intrinsic hazard of dental practice. For instance, it is know that episodes of airborne infection and tuberculosis occur more often in dentists than in persons engaged in other occupations, and more dental students contract tuberculosis than do medical students.[7,8] Hence, the routine use of rubber dam in appropriate situations should be obligatory to reduce infectious hazards.

Noteworthy is the fact that the degree of reduction (78 percent) in bacteria-laden aerosols near the operator was high, when the rubber dam was used, when

compared with a preoperative chlorhexidine gluconate mouthwash, which reduced contamination by 67.8 percent, as reported by Muir *et al.*[3] It would appear, therefore, that the use of the latter procedure together with rubber-dam isolation, high-volume aspiration, and routine wearing of masks would reduce considerably the inhalation of infective particles by the dental team. The other points of relevance are that, in general, the contamination fell sharply with distance from the headrest; and at three meters, there was minimal atmospheric contamination during operative procedures either with or without the rubber dam. This indicates that the impact of aerosolization of bacteria during dental procedures is limited to a radius of two to three meters from the headrest. Cabinetry and other objects sited at a greater distance are unlikely to receive surface depositions of bacteria-laden particles.

In quantitative terms, the bacterial contamination of settle plates observed in the current study is almost identical to that of Worrall, Knibbs and Glenwright, who investigated contamination of the atmosphere using an air polisher.[9] For instance, they found, as in the current study, that the colony-forming units for each 10-min period preoperatively and postoperatively (without rubber dam), ranged from 1.0 to 2.33. While these data give credence to our studies, it should be pointed out that the relatively high standard error observed perioperatively in the absence of the rubber dam is due to the wide variation in values, which is not uncommonly observed in studies of mass air-flow in rooms.[8]

Finally, viruses, anaerobic bacteria and other organisms requiring selective media were not cultured in this study. More studies are warranted to evaluate the efficacy of rubber dam isolation and other similar procedures in reducing atmospheric contamination, particularly by viral pathogens, such as HIV, hepatitis B, and respiratory viruses.

SUMMARY AND CONCLUSIONS

A study was made to ascertain the efficacy of rubber dam isolation in controlling atmospheric bacterial contamination, when conservative pedodontic procedures are performed. There was a highly significant ($p < 0.001$) reduction in bacterial contamination of the atmosphere, perioperatively, when rubber dam isolation was used. As the reduction in bacterial aerosols was greatest at 1 m from the headrest, the use of rubber dam would minimize significantly the inhalation of infective aerosols by dental personnel.

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LATCHKEY CHILDREN AND SUBSTANCE USE

Eighth-grade students who care for themselves eleven or more hours a week are at twice the risk of substance use (alcohol, tobacco, and marijuana) as those who do not take care of themselves at all. Tests for the influence of selfcare while controlling for other characteristics indicate that the risk persists for adolescents within each level of sociodemographic status, extracurricular activities, sources of social influence, and stress.

Richard, J. L. *et al*: Substance use among eighth-grade students who take care of themselves after school. Pediatrics, 84:556-566, September, 1989.

An analysis of compound and complex odontomas

Ronald W. Katz, DMD

Compound and complex odontomas are common odontogenic lesions.[1,2] Compound odontomas consist of varying numbers of small misshapen toothlike structures composed of enamel, dentin, cementum, and pulp in their proper spatial relationships. Complex odontomas are irregular masses of hard tissue composed of a disorganized combination of dentin, enamel, cementum, and pulp. Often they can be distinguished radiographically by the appearance of tooth-like structures in compound odontomas and a more uniform, but disorganized radiopaque mass in the complex form (Figures 1 and 2).

Although they are well recognized entities, there are relatively few published studies reporting on large numbers of cases.[3-8] Only the Kaugers *et al* study has reported on more than 200 cases without the use of case reports from the literature.[8] A large number of consecutively accessioned odontomas from two active biopsy services were analyzed to describe better their clinical and histologic features; those findings are reported here.

Often cases exhibit varying degrees of morphodifferentiation, and assignment into the compound or complex category is arbitrary.[9] It was decided that those cases exhibiting both forms of morphodifferentiation would be placed in a separate category (*mixed odontoma*) to reduce arbitrariness and prevent the masking of any clinical difference in clinical presentation between the two types. Ghost cell keratinization has been described in association with odontomas and was initially described as a feature of calcifying odontogenic cysts.[10-12] Cases containing ghost cell keratinization but lacking evidence of an ameloblastic epithelium were considered odontomas.

MATERIALS AND METHODS

The registries of the Oral Pathology Laboratory, Inc., of New York (56-45 Main Street, Flushing, New York) for the years 1981-83 and the Oral Pathology Laboratory of Temple University School of Dentistry (3223 Broad Street, Philadelphia, PA) for the years 1968 through mid-1985 were reviewed.* Slides on all cases coded as odontoma were retrieved. The clinical information was retrieved independently of the microscopic findings. The criteria used to categorize the compound and complex odontomas followed the definitions in common use.[9,14-16] Acceptable lesions were placed into one of three histologic categories: *compound odontoma, complex odontoma* or *mixed odontoma*. No cases considered to consist of a true "mixed odontogenic lesion" (ameloblastic odontoma, ameloblastic fibro-odontoma or calcifying odontogenic cyst associated with odontoma) were used in this study.

RESULTS

Three hundred and ninety-six cases were categorized. Two hundred and seventy-eight cases were classified

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*Information regarding a portion of the cases from Temple University has been previously published.[13]

as compound odontomas (70 percent), sixty-six cases were complex odontomas (17 percent) and fifty-two cases were placed in the mixed odontoma category (13 percent). There appeared to be no significant difference between the two pathology laboratories in the proportion of each type or in clinical findings. Foci of ghost cell keratinization were noted histologically in 37.1 percent of the odontomas.

Age-range

The distribution of odontomas according to age at time of treatment is shown in Figure 3.

☐ Compound odontomas

Seventy-one percent of all compound odontomas were diagnosed in patients aged six to twenty years. The age-range was two to seventy-four years. The most frequently affected age-group was the eleven to fifteen-year-old interval. Thirty-eight percent (102/270) of all cases occurred in this group. The ages thirteen and fourteen represented the peak years of treatment. Four cases involved the primary dentition, as evidenced by the noneruption/impaction of a primary tooth.

An attempt was made to determine whether there was a correlation between the location of the odontoma and the age at which treatment occurred. Using only those cases that were reported to involve a single tooth, the mean age at the time of treatment was determined. The average age of maxillary central incisor involvement was 10.4 years (twenty-eight cases). The lateral incisor area had thirteen cases with a mean age of 14.2 years. The maxillary canine regions had twenty-five cases with a mean age of 18.2 years and the maxillary third molar regions had twelve cases with an average age of 17.1 years. In the mandible, the canine areas exhibited a mean age at time of treatment of 16.6 years (thirty-six cases). Other locations were considered to have an insufficient number of cases and the average age was not determined.

The maxillary central-lateral incisor region had twenty-eight cases treated in the six-to-ten age-group, fourteen cases in the eleven-to-fifteen age-group and lesser numbers in the other age-intervals. In the maxillary canine region, the most frequent age at time of treatment was the eleven-to-fifteen age-group (twenty cases). Thirty-two of sixty-eight mandibular canine cases occurred in the eleven-to-fifteen age-group (47 percent). The frequency distribution of compound odontomas removed from patients aged five to twenty-five years for the maxillary incisor region, canine areas of all four quadrants, and the four third molar regions are illustrated in Figure 4.

Figure 1. Compound odontoma of the right maxillary canine region. Radiograph by courtesy of Major R. Zalme (USAF), AFIP, Washington, D.C.

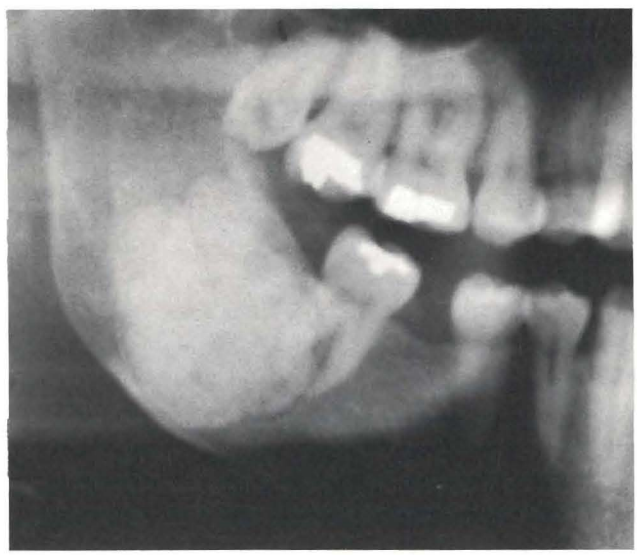

Figure 2. A complex odontoma in the right mandible of a twenty-four-year old Caucasian male.

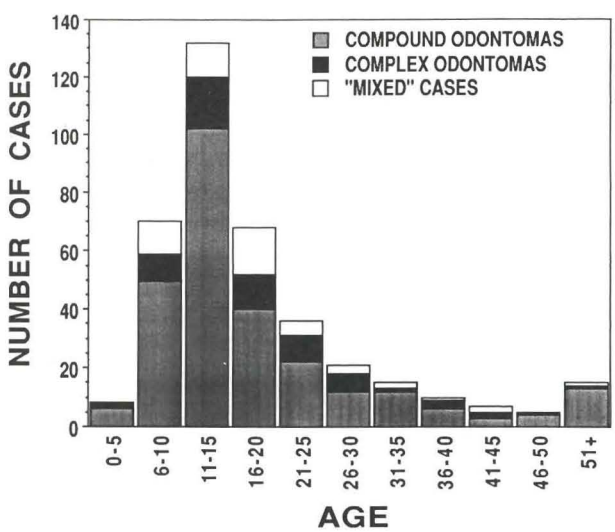

Figure 3. Frequency distribution for compound, complex, and mixed form odontomas.

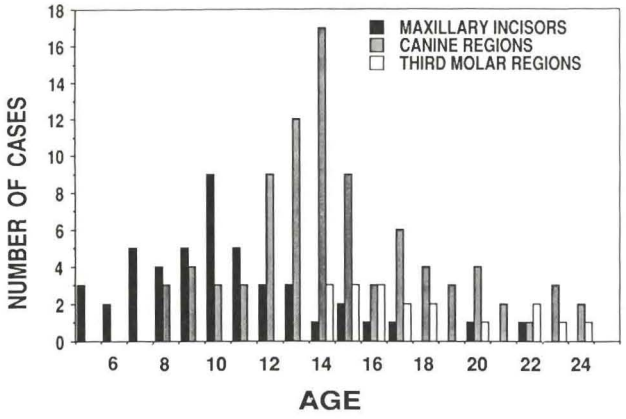

Figure 4. Frequency distribution for ages five to twenty-five-years of compound odontomas involving the maxillary incisors, maxillary and mandibular canines, and maxillary and mandibular third molars.

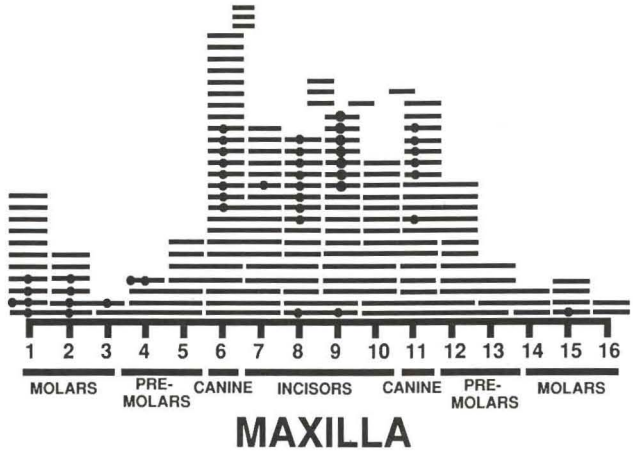

Figure 5. Site distribution of 131 compound odontomas of the maxilla. Circles represent unerupted teeth associated with each case.

☐ Complex odontoma

Seventy-three percent of all complex odontomas were diagnosed in patients aged six to twenty-five years. The age-range for complex odontomas was five to fiftyfive years. Complex odontomas were most frequently seen in the eleven-to-fifteen-year-old group; nineteen of sixty-six cases (29 percent) occurred in this group.

☐ Mixed odontomas

Seventy-three percent of all mixed odontomas were removed from patients aged six to twenty years. The age-range was six to fifty-nine years. One case involved the primary dentition. The most frequently affected age-interval was the sixteen-to-twenty-year-old group; 31 percent of all cases occurred in this age-range.

Location

Fifty-two percent of all compound odontomas occurred in the maxilla (Figures 5,6). Forty-six percent of 250 compound odontomas in which the location was provided involved the canine regions. Forty-eight cases involved the maxillary incisor regions (19.2 percent).

Forty-eight percent of all complex odontomas occurred in the mandible. Twenty-nine of sixty-one cases occurred in the molar area (49 percent). Thirty-six percent of the complex odontomas were in the right side of the jaws. Seventy-six percent of the cases in the molar regions were located on the right side of the jaws. Thirty-seven cases occurred in the premolar-molar areas, representing 61 percent of all complex odontoma cases. Sixteen cases involved the maxillary anterior sextant (26 percent) and twelve odontomas involved the canine regions of the jaws (20 percent). Figure 7 depicts the distribution by location of the complex odontomas.

In fifty mixed odontoma cases, sixteen involved the canine regions (32 percent); twelve, the molar regions (24 percent); and nine cases, the maxillary incisor region (18 percent).

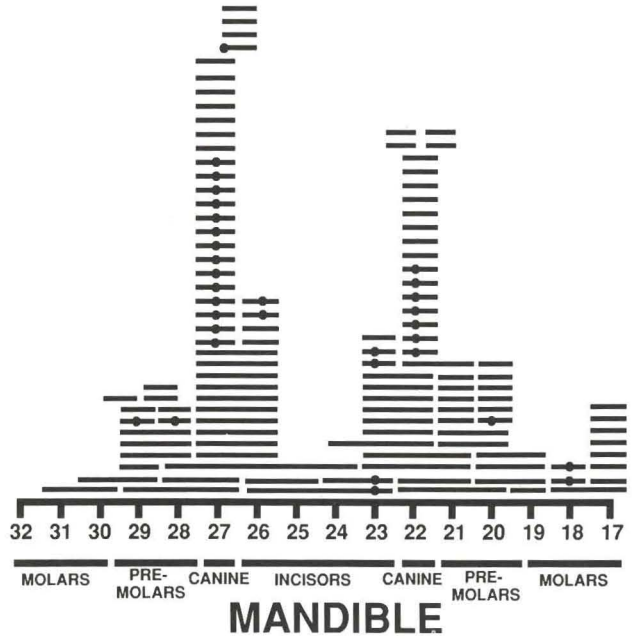

Figure 6. Site distribution of 119 cases of compound odontomas of the mandible.

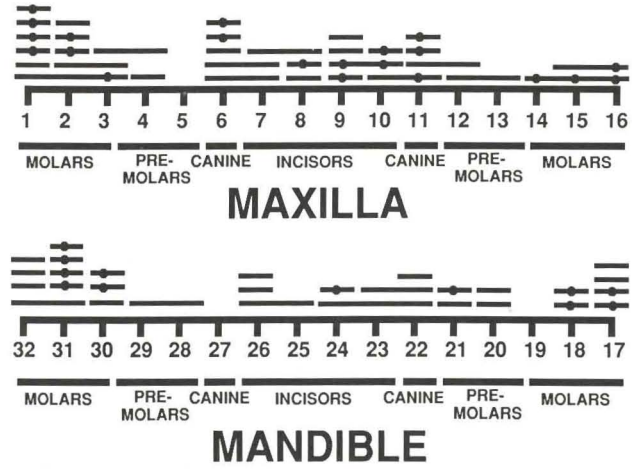

Figure 7. Site distribution of sixty-one complex odontomas.

Sex

In those compound odontomas where gender was indicated, 53 percent occurred in females (146/276 cases). Thirty-two of sixty-four complex odontomas occurred in females (44 percent) and equal numbers of mixed odontoma cases occurred in each sex (twenty-six of fifty-two cases). The differences in gender distribution for compound or complex odontomas were not statistically different from a hypothetical equal distribution according to chi square tests ($p > 0.05$).

Race/ethnic background

Racial information was not provided in the records from New York, but of those cases from Philadelphia indicating ethnic background, 77 percent (136 of 176) of the compound odontomas occurred in Caucasians. Thirty-five cases (20 percent) occurred in African-Americans. Three cases (2 percent) occurred in Asian patients and two cases (1 percent) occurred in patients of Hispanic background. Eighty-seven percent (34/39) of the complex odontomas occurred in Caucasians, four cases (10 percent) occurred in African-Americans and one case (3 percent) occurred in an Asian patient. Twenty-six of 32 cases (81 percent) of mixed odontomas occurred in Caucasians. Four cases (1 percent) occurred in African-American patients and one case (0.03 percent) occurred in a patient of Hispanic background.

Association with unerupted teeth

Seventy-six of 205 (37 percent) compound odontomas were associated with an unerupted tooth/teeth (Figures 5,6). Thirty-six cases involved impacted canines, twenty-six cases involved impacted maxillary incisors, and eleven cases involved impacted maxillary molars. Five cases reported missing teeth in the area of the odontoma (2 percent).

Among complex odontomas, thirty-one of sixty-one cases (51 percent) were associated with unerupted teeth (Figure 7). A total of twenty-one molar teeth were unerupted (one case had three unerupted molars, another case had two unerupted molars along with a molar tooth missing in the area of the odontoma). Five cases were associated with impacted canines and five cases with impacted incisors.

Nineteen of fifty (38 percent) mixed odontomas were associated with unerupted teeth. Eight of these cases (16 percent) involved unerupted incisors, six (12 percent) involved impacted molars, and five (10 percent) involved impacted canines.

DISCUSSION

The clinical description of odontomas in the literature has been somewhat confusing. This study and other studies have found no significant sex difference in the various types of odontomas.[4-6] This differs from the findings of Gorlin *et al* (2:1 female to male ratio) and Slootweg (2:1 male to female ratio) with regard to complex odontomas.[3,17] The age-distributions for complex and compound odontomas were similar in this study. Compound odontomas were somewhat more frequent in the six-to-ten-year age-interval compared to complex odontomas, but this can be attributed to the greater proportion of compound odontomas located in the maxillary incisor region. A comparison with previous studies showed similar age-distributions and most cases occur between the ages of five to twenty-five years.[4-8] Because previous reports used decade intervals to describe frequency distribution, it had not been possible to emphasize the fact that the peak-range of occurrence is from ages eleven to fifteen years. The majority of cases were diagnosed during the development and eruption of the permanent dentition (six to twenty-one years).[18,19] The ages thirteen and fourteen seem to be the peak treatment-ages of odontomas, with a sharp rise in occurrence starting at age eight and a noticeable drop occurring by age nineteen.

Some pathologists believe that all odontomas of the compound and complex types develop during the period of normal odontogenesis and eruption.[16,20,21] Cases in older patients are believed to be odontomas formed at a younger age and going undetected until the time of treatment. Slootweg and the present study present data that show that odontomas are removed from locations in which alterations in the normal eruption pattern or in the radiographic film can be noted at a younger age. In this study, the average age of patients with odontomas of the incisor area was earlier than those with odontomas of the canine regions or the third molar areas. This would suggest a correlation between the normal period of odontogenesis for a tooth and the development of an odontoma from that tooth organ.

Kaugers *et al* suggest from their study that a disproportionate number of cases occur in the African-American segment of the population.[8] In this study, the proportion of Caucasian to African-American patients (80 percent: 17 percent) mirrored the racial population of the standard metropolitan statistical area of Philadelphia.[22]

Budnick and Stasinopoulous noted that compound and complex odontomas were often associated with unerupted teeth (61 percent and 75 percent respec-

tively).[4,5] This study noted that association in only 41 percent, similar to that reported by Kaugers *et al* and suggests that studies that are based on compilations of published cases may be skewed as to the proportion of odontomas that involve unerupted teeth.[8] Canine teeth followed by maxillary central incisors and third molars were most frequently unerupted in association with odontomas. In addition, complex odontomas were proportionately more likely to prevent the eruption of teeth than compound odontomas.

The designation of compound or complex odontoma is a useful guide in describing differences in morphodifferentiation and helpful in understanding the interrelationship between normal and aberrant development. Whether one considers compound and complex odontomas to be hamartomas or neoplasms is more of academic interest than of clinical significance. From a clinical perspective, it is not important to distinguish between the two types of odontoma. The observation of some cases (i.e. mixed odontomas) exhibiting areas of organized morphodifferentiation along with areas of disorganization, illustrates the comment of Gorlin *et al* on odontogenic tumors in general, "..transitions from one type to another are commonly encountered and invention replaces precise classification.".[3]

Based on the data provided in this study, the following observations can be made. Compound and complex odontomas only rarely involve the primary dentition. Only five of 396 odontomas (2 percent) were associated with failure of a primary tooth to erupt. Tooth agenesis was not a common association with odontomas, only six of 396 (2 percent) cases noted this finding. Compound odontomas are four times more common than complex odontomas. Odontomas do not exhibit statistically significant differences in sex distribution for either the compound or complex types. Odontomas are most commonly removed from the eleven-to-fifteen-year age-group. Odontomas are apparently age and location related. Those from incisor locations are diagnosed and treated at an earlier age than those from the canine or third molar areas. Compound odontomas have a different distribution in the jaws than complex odontomas. Odontomas prevented the eruption of teeth in a third of the compound odontoma cases and half of the complex odontoma cases. Odontomas occur in all races and are not obviously associated with any particular racial background.

Odontomas are benign and are usually detected and removed from school-age children. They require excision and histologic study, in order to rule out the presence of neoplastic elements (ameloblastic odontoma, ameloblastic fibrodontoma, calcifying odontogenic cyst associated with odontoma) and to help correct the malocclusion or impactions possibly caused by their presence.

The author wishes to acknowledge the assistance of Drs. H. Lumerman, A. Miller and J. Fantasia in the writing of this paper, and the assistance of Ms. S. Howell of Temple University School of Dentistry and Dr. Victoria Porter of the National Institute of Dental Research with the illustrations.

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The use of dental sealants in the Washington State Medical Assistance Program: a second-year report

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Robert Isman, DDS, MPH

A review of the second year of a sealant project for children eligible for the Early and Periodic Screening, Diagnosis and Treatment program (EPSDT) in Washington State was undertaken. Sealants were added to the list of dental services provided to children, ages six to fourteen, in September of 1985. A previous report on the first year of the project documented the number of children served, the number of teeth sealed, the number of dentists participating, and the program cost.[1] This second year report examines similar factors and also compares first and second year data.

METHODS

The period selected for the data analysis was from November 1, 1986 to October 31, 1987. A retrospective review of the program accomplishments, utilization, and costs was completed by retrieving information from an extended data base developed by the Division of Medical Assistance. Each dental claim that contained a sealant as a unit of service was recorded for the one-year period. The data presented in this report reflect an unduplicated count of patients and providers from the entire state.

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The authors would like to thank Mr. Rich Boyeson and Mr. Gary Coats from the Washington State Division of Medical Assistance for providing the necessary review data.

RESULTS

During the study period, there was an average of 70,792 children, ages six to fourteen, who were eligible each month to receive dental services, including sealants. Individuals were provided dental services at private offices, public health dental facilities and community clinics. A total of 39,677 children, six to fourteen years of age, made at least one visit to a dentist from November 1, 1986 to October 31, 1987. Of this total, 6,814 or 17.2 percent received sealants in the first or second permanent molars.

Overall, there were 21,685 teeth sealed in Washington State during the second year of the Medical Assistance sealant program. This represents an average of 3.18 teeth sealed per child.

Seven-year-olds received sealants more frequently than other age-groups, followed by eight-year-olds. Fourteen-year-olds received sealants less frequently than children in any other age-category.

An average of 1,324 dentists participated each month in the Washington State EPSDT Program. For the twelve-month period covered by this study, 726 dentists placed sealants in eligible children in all counties.

In the second year of the statewide sealant program, the costs were $193,303. Expenditures for the initial year totalled $172,535. Thus, there was an increase of $20,768, or 12 percent for the second year of the project.

Table 1 ☐ Comparing the two years of the Washington State sealant program.

	Year one	Year two	Percent change
Average number of children, age 6-14, eligible for dental services per month, EPSDT November 1, 1986 to October 31, 1987,	63,561	70,792	+ 9.8
Number of children receiving sealants	6,191	6,814	+ 10.0
Percent of children who made at least one dental visit	17.3	17.2	− 0.1
Number of teeth sealed	19,590	21,685	+ 10.7
Average number of teeth sealed per child	3.16	3.18	+ .6
Number of dentists placing sealants	593	726	+ 22.0
Average cost of sealants per child	$28.60	$28.78	+ .6
Cost of sealant per tooth	$ 9.05	$ 9.05	0

Table 2 ☐ Number of children, by age, receiving sealants, 1986-1987.

Age	Number of children who made at least one visit to a dentist	Number of children who received sealants	Percent of age-group who received sealants
6	6,025	1.057	17.5
7	5,814	1,309	22.5
8	5,304	995	18.8
9	4,690	797	17.0
10	4,335	647	14.9
11	3,903	598	15.3
12	3,449	594	17.2
13	3,266	481	14.7
14	2,891	264	9.1

DISCUSSION

More children obtained sealants, 6,814 in the second year versus 6,191 in the first year, an increase of 10.2 percent. The overall percentage of children receiving sealants was similar (17.2 percent year two versus 17.3 percent, year one).

In contrast to the 19,590 teeth sealed in year one, 21,685 teeth were sealed in year two. The average number of teeth sealed per child remained relatively constant at 3.16 teeth in the first year and 3.18 teeth in the second year.

Children in the three youngest age-groups, six, seven, and eight, received slightly more sealants than children in the other age-categories. This finding may indicate dentists are sealing teeth at an earlier age, to minimize the risk of developing occlusal caries.

The number of dentists treating eligible children each month stayed about the same (1,317 first year to 1,324 second year); the number of dentists placing sealants increased, however, by 22 percent from 593 to 726 in year two. It is encouraging that more dentists placed sealants in the second year of the project. One of the initial objectives of the program was to promote the use of sealants for children enrolled in the Medical Assistance program.

SUMMARY

The second year utilization and cost data were reviewed for the Medical Assistance sealant program in Washington State. This report covers the period from November 1, 1986 to October 31, 1987. A total of 6,814 children received sealants, or 17.2 percent of all individuals (ages six to fourteen) who made at least one visit to a dentist.

Sealants were placed on 21,685 teeth, with an average of 3.18 teeth sealed per child. This represents 2,095 or 10.7 percent more teeth sealed than in the first year of the program.

There were 726 dentists who participated in the sealant program during the study period, for an increase of 22 percent over the previous year of the project.

The total cost of providing sealants to this group of children was $193,303. This represents an increase of 12 percent for the second project year.

In 1987 there were eighteen states that included sealants as a dental benefit for EPSDT children. A 1988 survey of dental programs in Medicaid reveals, however, that twenty-two states now provide sealants as a covered service.

The second-year report shows steady progress in the Washington State Medical Assistance sealant program.

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Behavior

A study of behavior modification for developmentally disabled children

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Patient management for overcoming behavior and anxiety problems is a constant challenge to the ability and experience of the dental practitioner, particularly if the practice includes mentally handicapped patients.[1] Dentists must change and improve management techniques as social attitudes toward dealing with children change: for example, the dental team should avoid using techniques parents may dislike. Murphy *et al* and Fields *et al*, studying a three-to-five-year-old population, found that parents regarded as unacceptable and unjustified the use of "hand over mouth" and the "Papoose Board."[2,3]

Studies with young, developmentally disabled patients in the dental setting have been very limited. Masek *et al* found that praise and token reinforcement were effective in improving cooperation in four young mentally retarded children.[4] Developmentally disabled children are not given enough attention and many of these children can receive routine dental care, if properly managed.[5,6]

Desensitization and modeling are two behavior-modification techniques that have been widely used in our field. With desensitization, we provide the child new and more pleasant associations to pair with the anxiety provoking stimuli.[7,8] With modeling, a young patient can learn about the dental experience by watch-

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ing other children undergoing dental treatment.[8] Various authors have reported desensitization and modeling to be successful in providing familiarization and improving behavior.[8-12]

Gatchel used a videotaped program based upon modeling and desensitization to reduce fear in people who avoided dental treatment.[10] Melamed considers modeling more effective when the model is similar in age to the child exposed to the technique.[13]

It is important in behavioral research to have valid measures for evaluating the children's behavior. Melamed's Behavior Profile Rating Scale is objective and shows a high degree of reliability.[14] Some researchers have considered heart rate as a useful tool for measuring stress during dental procedures.[14-16] Physiological measures can be used when there is a decreased chance of finding variations in overt behavior.[14] Behavioral rating scales do not correlate well with other kinds of tests like physiological tests or projective tests.[14]

The two-fold purpose of this investigation was:

- ☐ To develop a tape-slide series in order to prepare three-year-old and four-year-old, developmentally disabled children for an initial dental examination and to learn whether the audiovisual product developed could modify their behavior.
- ☐ To study whether the evaluation techniques used were sensitive enough and related to each other.

METHODS AND MATERIALS

Population

Twenty-eight children attending Preschool Special Education at John Williams School No. 5 in the city of Rochester, NY, were chosen to participate in the study. The ages of the children at the time of the study ranged from three to four years.

All the children were developmentally disabled, twenty were speech impaired (SI), four were mentally retarded (MR), and four had been diagnosed as having learning disabilities (LD).

The study population was divided into two groups: experimental and control. The groups were matched according to baseline heart rate, age, IQ, and diagnosis. It was required that the young patients were not previously exposed to a dentist. A consent form was signed by parents or guardians for each child.

Intelligence Quotient

The IQ was measured for each child participating in the study. Three tests were used: Stanford Binet, Kaufman Assessment Battery for Children, and Leiter International Performance Scale. The test performed on each child was chosen by school psychologists according to the verbal abilities of the child. The different tests have equivalent means and standard deviations so that the IQs are statistically equivalent.

Figure 1. The clown, the repetitive factor in the study.

Figure 2. The four-year-old model.

Heart rate

Heart rate was measured with a pulse monitor.

Tape-slide series

For the slides, a professional clown (Figure 1) and a four-year-old girl (Figure 2) were chosen as models.

Examination of them was completed in six steps:

- ☐ Patient positioning.
- ☐ Oral examination.
- ☐ Prophylaxis.
- ☐ Radiographs.
- ☐ Fluoride application.
- ☐ End of the appointment.

The tape, which has a duration of three minutes and thirty-three seconds, explains what happens the first time children go to the dentist. The explanation is given by a female narrator using a soft voice and appropriate "Pedolanguage". Music and sounds were added to the tape to promote the constant attention of the young audience.

Evaluation of the tape-slide series

The tape-slide series was evaluated by a group of parents of the children, a group of psychologists and teachers from Rochester, and a group of postdoctoral students from Eastman Dental Center. All members of all groups considered the audiovisual product to be appropriate for the young patient. All parents evaluated it as excellent. Two-thirds of the psychologists and teachers evaluated it as excellent and one-third, as good. Eighty percent of the postdoctoral students considered it excellent and 20 percent good.

Dental examinations

Children in the experimental group were taken to the examination room immediately after exposure to the tape-slide series on an individual basis. Examinations were done in the morning and limited to fifteen minutes. Only children not taking any medication were accepted for the study. All the children were seen by the same examiner, a pediatric dentist who works with developmentally disabled patients on a daily basis. The study was designed to be blind in regard to exposure to the tape-slide series and the disabling condition of the child.

A rubber-cup prophylaxis was performed with a slow-speed handpiece. With the use of x-ray film size "0" and an unplugged portable x-ray machine, the taking of bitewing radiographs was simulated. The children were given a topical fluoride treatment utilizing disposable trays. At the end of the appointment, they were given a small toy as recommended for positive reinforcement.

Table 1 ☐ Table used for measuring heart rate.

	Heart rate
1. Patient positioning	
2. Oral examination	
3. Prophylaxis	
4. Taking of the xrays	
5. Fluoride application	
6. End of the appointment	

Behavior evaluation: methods

Three methods were used for evaluation of the behavior modification.

☐ Physiological measure: heart rate.

Heart rate for *patient positioning* was measured two minutes after the patient had been sitting in the chair; for *oral examination*, when the mirror and explorer were introduced into the oral cavity; for *prophylaxis*, when the rubber cup contacted the teeth; for *taking of the x-rays*, when the film was introduced into the mouth; for *fluoride application*, when the trays were introduced into the mouth; and finally for *end of the appointment*, two minutes after the dental procedures were completed (Table 1).

☐ Dentist's subjective evaluation

This was done following the same six steps described in Table 1, utilizing the following rating scale: 5 = excellent, 4 = good, 3 = fair, 2 = poor, and 1 = very poor.

☐ Modified Melamed's Behavioral Rating Scale

Melamed utilized a scale for completing two procedures: an initial examination and a restorative treatment.[12] In this study, since only one examination was performed, the scale was modified (Table 2).

RESULTS

Mean scores

The mean scores of age, IQ, dentist's subjective evaluation, heart rate, and modified Melamed's Scale were calculated for the three groups.

Unpaired T-tests

Four unpaired t-tests were performed, comparing children exposed and children not exposed to the tape-slide series technique. Significance was chosen for p-values less than 0.05.

☐ Speech impaired group (Table 3)

For the dentist's evaluation all p-values were low, approaching significance. The difference is statistically significant in *patient positioning* and *end of the ap-*

Table 2 ☐ Modified Melamed's Behavioral Rating Scale

	1. Patient positioning	2. Oral examination	3. Prophylaxis	4. Taking of the xrays	5. Fluoride application	6. End of the appointment
Inappropriate mouth closing (1)						
Choking (1)						
Won't sit back (2)						
Attempts to dislodge instruments (2)						
Verbal complaints (2)						
White knuckles (2)						
Negativism (2)						
Eyes closed (2)						
Verbal message to terminate (3)						
Refuses to open mouth (3)						
Rigid posture (3)						
Crying (3)						
Dentist uses loud voice (3)						
Kicks (4)						
Stands up (4)						
Rolls over (4)						
Dislodges instruments (5)						
Refuses to sit in chair (5)						
Leaves chair (5)						

Table 3 ☐ Unpaired t-test comparing tape-slide speech impaired group and non-tape-slide speech impaired group.

	Part	p-value	Interpretation
D.E.	1	0.0465	* S.
	2	0.1372	N.S.
	3	0.1356	N.S.
	4	0.0886	N.S.
	5	0.1744	N.S.
	6	0.0316	* S.
H.R.	1	0.2507	N.S.
	2	0.0080	* S.
	3	0.1551	N.S.
	4	0.1176	N.S.
	5	0.1003	N.S.
	6	0.0014	* S.
M.M.	1	0.6351	N.S.
	2	0.2087	N.S.
	3	0.2241	N.S.
	4	0.2812	N.S.
	5	0.2385	N.S.
	6	0.5569	N.S.

N.S. = not significant
* S. = significant (p value < 0.05)
D.E. = Dentist Evaluation, H.R. = Heart Rate, M.M. = Modified Melamed's Scale

Table 4 ☐ Unpaired t-test comparing tape-slides sample and non-tape-slides sample - total population.

	Part	p-value	Intepretation
D.E.	1	0.2500	N.S.
	2	0.4166	N.S.
	3	0.6458	N.S.
	4	0.3772	N.S.
	5	0.5396	N.S.
	6	0.5782	N.S.
H.R.	1	0.0424	* S.
	2	0.0142	* S.
	3	0.1493	N.S.
	4	0.2091	N.S.
	5	0.0942	N.S.
	6	0.0004	* S.
M.M.	1	0.7447	N.S.
	2	0.7913	N.S.
	3	0.8748	N.S.
	4	0.9413	N.S.
	5	0.7682	N.S.
	6	0.3619	N.S.

N.S. = not significant; * S. = significant (p value < 0.05); D.E. = Dentist Evaluation; H.R. = Heart Rate; M.M. = Modified Melamed's Scale

pointment. Children not exposed to the technique behaved better.

For heart rate all p-values but one, *patient positioning*, were low. They were close to significance. *Oral examination* and *end of the appointment* showed a statistically significant difference. Heart rate for the children exposed to the tape-slide series was always higher.

Modified Melamed's Scale was not a good measurement of behavior in this study, because it did not relate to the other two. All scores showing a trend for better behavior were lower, however, for the non-tape-slide series group, in all six parts of the appointment.

☐ Learning disabled and mentally retarded groups
We cannot make strong statements for these groups, because of the small sample sizes. There is a marked trend toward lower heart rates and better behavior, however, for the groups not exposed to the technique.

☐ Total population (Table 4)
The dentist's evaluation loses all significance when combining the overall population, which suggests that it was done differently for each group.

Heart rate seems an objective measurement. The trend in heart rates for the overall population is roughly the same as for the speech impaired group. The tape-slide series group shows a higher heart rate in every part of the appointment. The difference is significant in *patient positioning*, *oral examination*, and *end of the appointment*.

Modified Melamed's Scale does not seem to be a good way to measure behavior in this study.

Anova (Table 5)

An *analysis of variance* was performed to examine any differences in the ways the groups were rated. This test was indicated because of the results of the overall t-test, which suggested some differences when evaluating different groups.

The p-value in the dentist's evaluation shows that there is a significant difference in the way the dentist evaluated the different groups. For heart rate, all groups were essentially the same, even though the p-values for the nontape-slide series group were borderline. That means that this is a better objective measurement, while the dentist's evaluation is subjective and related to personal sensitivity and experience in treating developmentally disabled patients. Since nothing significant emerged from the t-tests for modified Melamed's Scale, we did not consider further examination for this scale.

Table 5 ☐ Analysis of variance testing for differences among groups.

Non-tape-slides group	p value	Interpretation
D.E.	0.0003	* S.
H.R.	0.0435	* S.
Tape-slides group		
D.E.	0.0150	* S.
H.R.	0.5104	N.S.

N.S. = not significant
* S. = significant (p value < 0.05)
D.E. = Dentist Evaluation, H.R. = Heart Rate

DISCUSSION

The study was completed based on the number of children available. For future studies, if problems like budgeting, personnel, and time available are solved, the possibilities of working with a larger group should be considered.

The technique using a modeling and desensitization approach offers realistic information that accurately describes what to expect during the first appointment of a child in the dental office. The language selected is appropriate for three-year-old and four-year-old children. The length of the audiovisual presentation is also appropriate for the population used: three minutes and thirty-three seconds. The little girl chosen as a model was four years old, close in age to the population used, which, according to Melamed, improves the effect of modeling.[13] The clown experiencing each procedure first provides needed repetition. During the measurement of heart rate in the speech impaired group, it was noted that the rate for the tape-slide series group was always higher in every section of the study. When the total population was analyzed, a higher heart rate for the tape-slide series group was also found in every part of the appointment. A possible explanation for the higher heart rate in the experimental group could be that the presentation itself had excited the children.

It was thought that with the modifications introduced, Melamed's Scale would generate enough information for measuring behavior; but the scale did not relate to the other measures of behavior and did not appear an appropriate way to measure behavior in this study. Furthermore, it was not sensitive enough.

The dentist's subjective evaluation had limitations, because of the intrinsic subjectivity involved and because of the possibility that the behavior of the child in one part of the appointment may have influenced the ratings in other sections of the study. When the dentist's subjective evaluation was analyzed for overall population, it lost all significance, suggesting that it was done differently for each group.

When and how to expose the child to the audiovisual material is a controversial point. It is important to establish the best time for the presentation of a preparatory film. We followed Melamed's suggestion that considers film modeling more effective when the children are exposed to it immediately before.[12] Younger children do not retain information very long and retain less of it than older children.[11,15] Perhaps it would be better, following the points of view expressed by other authors, to introduce a time-interval between the tape-slide series and the dental procedure, to allow the children to marshal their defenses and experience desensitization.

The tape-slide series excited the children. Maybe the clown, the music, the sounds, and the pace of the narration were not appropriate and the children entered the dental office in a high state of arousal; or perhaps the children were in a state of arousal, because the information itself increased awareness and made children suspect problems. It could be that the audiovisual product was not appropriate for developmentally disabled children and produced some confusion in them. The way to learn whether the results were attributable to the population used would be to perform the same study with normal children.

It was not possible to analyze the long-term benefits of the modeling desensitization technique. If a study following the population that participated in the study could be performed, it would be interesting to evaluate the long-term effects of the technique.

Presentation of the tape-slide series is not a time-consuming approach and could be easily utilized in the dental office. This type of behavior modification tech-

nique can be used in the time the child spends in the waiting room and shown individually or in groups. Parents who were shown the audiovisual material considered it appropriate and useful; this is an important factor because children can be motivated through their parents.

CONCLUSIONS

- ☐ Sample size is a critical factor.
- ☐ Heart rate: as reported in other studies, it was sensitive and objective in measuring anxiety and arousal.
- ☐ Modified Melamed's Scale was not sensitive enough in the present study to measure microbehavior.
- ☐ The subjective dentist's evaluation demonstrated that it was not possible to prevent a biased evaluation of the groups by the dentist. This finding could have been influenced by the sample size.
- ☐ Children exposed to the tape-slide series showed worse behavior and a higher heart rate than children not exposed to it.
- ☐ A follow-up study should contemplate the evaluation of the long-term benefits of this modeling-desensitization technique.
- ☐ Research using the tape-slide series with a group of normal children could be useful to find out what the similarities or discrepancies are between the two groups under similar conditions.

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MATERNAL ALCOHOL USE DURING BREASTFEEDING

The results of this study show an association between maternal alcohol use during lactation and infants' motor development at one year of age. With four drinks taken by a 60-kg mother, the ingestion of ethanol through breast milk is estimated to be 232 mg (0.010 oz) in a 5-kg infant (with use of Kesaniemi's method). If this amount is detrimental, at least two mechanisms are possible: either the developing brain is exquisitely sensitive to very small quantities of ethanol, or the small quantities ingested during lactation accumulate in the infant and affect his or her motor skills.

Little, R.E. *et al*: Maternal alcohol use during breast-feeding and infant mental and motor development at one year.
N Engl J Med, 321:425-430, August, 17, 1989.

Demography

1980–1990: What a difference ten years have made in the future of pediatric dental practice

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

At the 1980 annual meeting of the American Academy of Pedodontics and in subsequent writings, Meskin *et al* outlined a bleak future for pediatric dental practice.[1,2]

- ☐ The profession of pediatric dentistry appeared to be moving toward an excess of supply.
- ☐ Increased numbers of young pediatric dentists had secondary practice locations and many were establishing practices in smaller population areas.
- ☐ Waiting periods for patient appointments were exceedingly short.
- ☐ Some practices were experiencing decreases in new patients.
- ☐ There were signs of pediatric practitioner dissatisfaction associated with unrealized income expectations.

Writing in the early 1980s, this writer titled a presentation on pediatric dental manpower, "Verifying an oversupply of pedodontists: some added factors."[3] The then current information on the increasing number of pediatric dentists, supplemented with data on the decreasing population under eighteen years of age, stagnation in the use of dental services, decreases in dental caries, and minimal financial support for dental services by governmental agencies, all seemed to confirm a general pessimistic future for pediatric dental practice.

But this is 1990 — and what a difference ten years have made!

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Table 1 ☐ U.S. population less than eighteen years of age: 1980 census, projected 1990 and 2000.[4]

Age	Census 1980	Projected 1990	Projected 2000
		(in millions)	
< 5 yrs.	16.3	18.4	16.9
5-13 yrs.	31.2	32.4	33.5
14-17 yrs.	16.2	13.2	15.3
Totals	63.9	64.0	65.7

Table 2 ☐ Mean decay-missing-filled rates for children: 1979/80, 1986/87.[5,6]

Age	Year	Mean decayed-filled-surfaces
5-9 yrs.	1979/80	5.31
	1986/87	3.91
		Mean decayed-missing-filled-surfaces
5-17 yrs.	1979/80	4.77
	1986/87	3.07
		Percent filled of DMFS
	1979/80	76.1%
	1986/87	82.3%
		Percent caries-free
	1979/80	36.6%
	1986/87	49.9%

Table 3 ☐ Percent of children less than fifteen years with a reported dental visit and the number of visits per year: 1978/79, 1986.[7,8]

Age	Year	Percent with reported visit: Within last year	Never visited a dentist	Number of visits per child
< 5 yrs.	1978/79	14.3%	82.6%	0.4
	1986	18.7	86.9	0.4
5-14 yrs.	1978/79	64.1	11.6	2.0
	1986	70.7	9.2	2.3

DO YOU REMEMBER DENTISTRY IN 1980?

Dental advertising and commercial dentistry had just become a reality. Dental schools only recently had begun to decrease the number of entering first year students from the all-time highs reached during the late 1970s. There were still more than 9,600 applicants for 6,000 entering places. For the first time, more than 700 women were graduating annually from dental schools. Expanded-duty dental auxiliaries and independent denturists were major topics of discussion. The number of dentists and the ratio of dentists to the population were continuing to rise. Decreases in dental caries and a general changing pattern of dental disease were a reality. And dentistry was feeling the effects of the recession that was striking the economy of the entire nation. We were a profession in turmoil and the specialty of pediatric dentistry (nee pedodontics) appeared to be in trouble.

IT IS 1990 AND DENTISTRY HAS CHANGED QUITE A BIT

Although many continue to be dissatisfied, the profession has learned to live, to some extent, with advertising and commercial dental practices. Since the late 1970s, dental schools have decreased the sizes of their entering classes by more than a third. Five dental schools have closed or are in the process of eliminating the predoctoral programs; and the existence of other dental schools is threatened.

In 1988, there were 5,000 applicants for the 4,200 entering places. More than 1,200 women graduated from schools of dentistry. By the late 1980s, discussions about expanded-duty dental auxiliaries and independent practicing denturists were replaced by the difficulties in hiring and retaining auxiliaries in practices, ever-increasing overhead costs and the demands by dental hygienists for independent practice arrangements.

But in 1990, the increase in total number of dentists is slowing (to reach a high in 1996) and the ratio of dentists to the population has begun to decline. Decreases in dental caries and a general changing pattern of dental disease continue to be a reality. But the economics of dentistry continue to improve. We may still be a profession in turmoil, but the specialty of pediatric dentistry no longer appears to be in trouble.

WHAT OF PEDIATRIC DENTISTRY IN 1990?

The patients

- ☐ The number of children in the nation remained stable between 1980 and 1990. By the year 2000, there will be an increase of 1.7 million children (Table 1).
- ☐ Between 1979/80 and 1986/87, the decayed-filled-surfaces and decayed-missing-filled surfaces (DMFS) rates decreased; percent caries-free children increased. An increased demand for services was reflected, however, in the increase in the *filled* component of the DMFS rate (Table 2).
- ☐ During the first two-thirds of the 1980s, there was an increase in the percent of children who visited a dentist in the past year, an increase in the number of visits per child, and a decrease in the percent of children who never visited a dentist (Table 3).

☐ During the first half of the 1980s, there was an increase in the number of children with handicapping conditions and physical limitations — the area of a pediatric dentist's particular expertise (Table 4).

Pediatric dentists

☐ During the 1980s, the number of pediatric dentists and pediatric dentists per population increased markedly (Table 5).

☐ By the late 1980s, however, the "production" of pediatric dentists was declining. The numbers of accredited pediatric specialty programs reduced (Table 6), and the numbers of senior dental students expressing an interest in the specialty have decreased (Table 7). As a result, the numbers of students enrolled in, and graduating from, the pediatric dental programs have decreased (Table 8).

The finances of pediatric dental services

☐ Between 1980 and 1990, an increasing share of national expenditures for dental services was covered by private insurance programs. The direct payment share of expenditures decreased and the very minor share covered by government programs decreased even further (Table 9).

☐ In addition, an increased percent of children had dental insurance coverage (Table 10). And children with dental insurance coverage use more dental services than children without insurance coverage.

☐ During the 1980s, despite an increase in the number of professionally active dentists, there was an increase in current and constant dollar (i.e. removing the effects of inflation) expenditures per dentist (Table 11).

☐ And in the 1980s, current and constant dollar pediatric dentist gross receipts increased (Table 12). (Note: Net income data for pediatric dentists are not available from the American Dental Association or the proprietary dental publications.[23])

Table 4 ☐ Population of children with limited activities: 1980, 1985.[7]

	1980	1985
	(in millions)	
Limited but not in major activity	1.0	.9
Limited in amount or kind of major activity	1.1	2.0
Unable to carry on major activity	< .1	.3
Totals with limitations	2.2	3.1

Table 5 ☐ Number of pediatric dentists and pediatric dentists per million population.[9,10]

Year	Number	Pediatric dentists per million pop.
1979	1,776	7.9
1987	3,089	12.7

Table 6 ☐ Number of accredited pediatric specialty programs: 1980 and 1988.[11]

Year	Dental school	Non-Dental school
1980	41	23
1988	37	18

Table 7 ☐ Number of senior dental students expressing an interest in pediatric dentistry training programs: 1980, 1988.[12,13]

Year	Number
1980	126*
1988	87**

* Based on 2.4 percent of 5,256 graduates.
** Based on 18.9 percent of 4,581 graduates who were interested in specialty programs, and the 10.1 percent of this subgroup who were interested in the specialty of pediatric dentistry.

Table 8 ☐ Number of first year students, total enrollment and graduates from pediatric dentistry specialty programs: 1980, 1988.[11]

Year	First year	Total enrollment	Graduates
1980	190	377	167
1988	162	335	136

Practice arrangements, or is change all bad?

"Increased numbers of young pediatric dentists had secondary practice locations and many were establishing practices in smaller population areas." In 1980, these developments were considered as indicators of a tight competitive market in pediatric dental services. But in 1990, we have come to recognize that these developments are part of a general evolving complex pattern for the delivery of all health services.

HMOs, PPOs, IPAs, PROs, DRGs, HSAs, and the rest of the alphabet soup of organizations and practice arrangements have become everyday realities. So too have variety and complexity come to the internal structure of dental practice. For example:

Table 9 ☐ Percent distribution of national expenditures for dental services by source of payment: 1980, 1990.[14-16]

	Private		Public		
Year	Private insurance	Direct payment	Federal Gov't	State & local	Totals
1980	23.4%	72.7%	1.9%	1.9%	99.9%
1990*	33.9	64.1	1.0	1.0	100.2

* Projected

Table 10 ☐ Percent of children with dental insurance: 1980, 1986.[8,17]

Age	1980	1986
2-4 yrs.		40.2%
< 5 yrs.	35.5%	
5-11 yrs		42.8
5-14 yrs.	38.5	
12-17 yrs.		43.1

Note: 1980 data include Medicaid coverage.

Table 11 ☐ Current and constant dollar expenditures per active dentist: 1980, 1989.[14,15,18-20]

	1980	1989*
Professionally active dentists	126,240	139,801
National dental expenditures (billions)	$15.4	$41.1
Current dollar expenditure per active dentist	$121,989	$293,274
Dental component CPI (1977 = 100)	129.8	235.4
Constant dollar expenditure per active dentist	$93,982**	$124,585

* Projections.
** Constant dollar expenditures per active dentist decreased from $94,234 in 1979.

Table 12 ☐ Current and constant dollar pediatric dentist gross income: 1982, 1987.[21,22]

Year	Current dollar	Constant dollar
1982	$182,856	$63,359
1987	241,187	71,996

☐ Between 1980 and 1986, there was a 16.7 percent growth in the total number of dental facilities in the United States. During this same period, however, there was only a 1.4 percent growth in facilities employing less than five individuals, and as much as an 80 percent growth in facilities with a greater number of employees. By 1986, one dental establishment had more than 250 employees.[24]

☐ The needs and desires of the increasing number of female dental practitioners often are different from those of male dentists. A greater percent of female dentists, than their male counterparts, worked less than thirty hours per week. And female practitioners who graduated from dental schools after 1975, report scheduling fewer appointments per week and working fewer weeks per year than their male counterparts.[18,25] (Note: While both male and female practitioners provide dental services to children, many female dentists demonstrate particular interest in the care of children.[26])

☐ The establishment of pediatric dental practices in smaller population areas, to a degree, may reflect the reality that the population in these less urban areas is demonstrating a greater increase in the use of dental services than their more urban counterpart.[27,28]

In essence, some of the measurements used in 1980 to describe the "health" of pediatric dental practice may have been reports on the advance wave of many of the changing realities of dental practice; rather than the "imminent demise" of pediatric dental practice.

WHAT ABOUT PEDIATRIC DENTAL PRACTICE IN THE 1990s?

Increasing numbers of children, increasing expenditures for dental services, increasing demand for dental services by a broader spectrum of children, decreasing numbers of dentists, and better control of the numbers of pediatric dentists—that's the good news. Improving oral health, more third party and government oversight, and continued commercial dental practice arrangements that's the not-so-good news. But we have come a long way from 1980, when all of dentistry (not just pediatric dentistry) seemed all but moribund.

The growing concern of the general population for preventive health services, the increasing surviving population of developmentally disabled and medically compromised children requiring the particular training and experience of pediatric dentists, and the willingness to seek a variety of practice arrangements and locations, all signal both more favorable opportunities for pediatric dentistry and the availability of practitioners to provide needed services for children.

If the 1980s were any indication of the dramatic changes that one may expect in the 1990s, then pediatric dentists, the general dental profession, and the health system in general are in for many surprises.

But as we enter the last decade of the twentieth century, we can look forward with greater optimism —

knowing what a difference ten years have made in the practice of pediatric dentistry!

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AIDS AS A CAUSE OF DEATH IN CHILDREN

Human immunodeficiency virus (HIV) disease is increasing rapidly in the ranks of the leading causes of death among children. It is already the ninth leading cause of death among children one to four years of age and the seventh in young people between the ages of fifteen and twenty-four years. If current trends continue, AIDS can be expected to move into the top five leading causes of death in the pediatric and adolescent age group in the next three or four years. To address this problem and also to provide focus for the U.S. Department of Health and Human Services activities dealing with pediatric AIDS, an intradepartmental work group was established as a central health and human services component. This was done to ensure the best possible use of federal resources on behalf of children and adolescents with AIDS. Its recommendations are the basis of this report.

Novello, A.C. *et al*: Final report of U.S. Department of H.H.S. on Pediatric HIV. Pediatrics, 84:547-555, September, 1989.

Change in dental treatment needs in an urban pediatric population, 1977 to 1987

Epidemiology

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Over the past decade, several studies documented the decreasing caries activity in children.[1-4] This change in dental disease patterns prompted concerns among dental educators, regarding their ability to provide undergraduate students with adequate training in pediatric dentistry.[5,6] Virtually every dental school has had to reach beyond its boundaries to resolve this problem. Many schools are using satellite and/or hospital clinics to provide their students with adequate experience in treating pediatric populations.

Fifty-eight years ago, a Kansas City dentist established a dental program at the University of Missouri-Kansas City School of Dentistry designed to:

- ☐ Serve the dental needs of first and second graders from four schools in the Kansas City urban school district.
- ☐ Provide dental students with necessary experience in pediatric dentistry.

It is the purpose of this report to describe the changes in dental care provided for this urban pediatric population during the decade from 1977 to 1987.

The authors are members of the faculty of the University of Missouri - Kansas City, School of Dentistry, in the Department of Pediatric Dentistry.

HISTORY

In 1930, a program to serve the dental needs of six-year-old and seven-year-old children from four urban Kansas City schools was begun at the University of Missouri-Kansas City School of Dentistry. The program, which operates as the "Lowry Clinic", was established by a trust fund bequeathed by a local Kansas City dentist, Dr. Howard S. Lowry. In addition to the trust, the program receives additional financial support from the University as a community service.

Undergraduate dental students during either their third or fourth year are assigned to "Lowry Clinic" for one semester, one morning per week (approximately 42 hours per semester). The children are brought to the dental school under the supervision of the school nurse or a parent volunteer. Each child must present a completed health history form and a signed parental consent form before any treatment is begun. The child is then assigned to a student for comprehensive care.

MATERIALS AND METHODS

For this study, clinical records were obtained for the following academic years: 1977-1978, 1980-1981, 1985-1986, 1986-1987, and 1987-1988. Seventy patient records were available for 1977-1978, 153 records for 1980-1981, 152 records for 1985-1986, 243 records for 1986-1987, and 143 records for 1987-1988. The following data were collected from each record: name, date of birth, sex, Frankl behavior rating, and treatment accomplished on specific primary and/or permanent teeth. Data regarding treatment were then categorized in five groups as follows: simple amalgams, complex amalgams, stainless steel crowns, pulpotomies followed by stainless steel crowns, and extractions. The proportion of patients treated with a particular operative procedure was determined along with an analysis of the frequency with which a particular operative procedure was performed on any one subject. Data were analyzed using a chi-square analysis where results were significant at $p < 0.05$.

RESULTS

Table 1 indicates that between 1977 and 1987, there was a significant decrease in the proportion of patients treated with simple and complex amalgam restorations. The table also shows a significantly smaller proportion of patients requiring stainless steel crowns in 1985 and 1986-than in 1977. In this population, however, there was no statistically significant difference in the proportion of patients requiring stainless steel crowns in 1987 than in 1977. Again, a statistically significant decrease in the proportion of patients treated with pulpotomies was noted in 1986 compared to 1977. There were no significant differences in the proportion of patients requiring tooth extractions during this ten-year period.

Table 2 demonstrates the differences in the number of procedures required per patient during each academic year of the study. The Table shows, for example, that significantly fewer amalgam restorations were required per patient in 1985, 1986, and 1987 than in 1977 and 1980. Similarly, the number of stainless steel crowns and pulpotomies completed per patient also declined dramatically from 1977 to 1987.

Figure 1 compares the proportion of patients requiring no simple amalgam restorations to patients requiring three or more simple amalgam restorations, during the selected years from 1977 to 1987. The proportion of patients requiring no simple amalgam restorations increased substantially from 1977 to 1987. In contrast, the proportion of patients, in this urban population, who required three or more simple amalgam restorations has shown little change during this decade.

Similar comparisons between the proportion of patients requiring multiple stainless steel crown restorations and those patients who did not require such treatment are shown in Figure 2. In 1985 and 1986 there was a dramatic increase in the percentage of patients who did not require stainless steel crown restorations. In comparison, except for the academic year 1980-81, there was little change in the proportion of this population that required multiple stainless steel crown restorations.

Table 1 ☐ Percent of patient population treated by specific procedures for years in which operations were performed.

Procedure	1977	1980	1985	1986	1987
Simple amalgam restorations	57%	62%	39%*	41%*	42%*
Complex amalgam restorations	60	33*	27*	30.5*	14.7*
Stainless steel crowns	27	17	9*	12*	21
Pulpotomies	23	18	13	9*	13
Extractions	19	19	16	16	14

*$p < 0.05$

Table 2 ☐ Mean procedures completed per patient for years in which operations were performed.

Procedure	1977	1980	1985	1986	1987
Amalgam restorations	2.76	2.42	1.63*	1.60*	1.24*
Stainless steel crowns	0.76	0.58	0.36*	0.24*	0.27*
Pulpotomies	0.40	0.29	0.20	0.14*	0.12*
Extractions	0.31	0.37	0.36	0.40	0.20

* $p < 0.05$

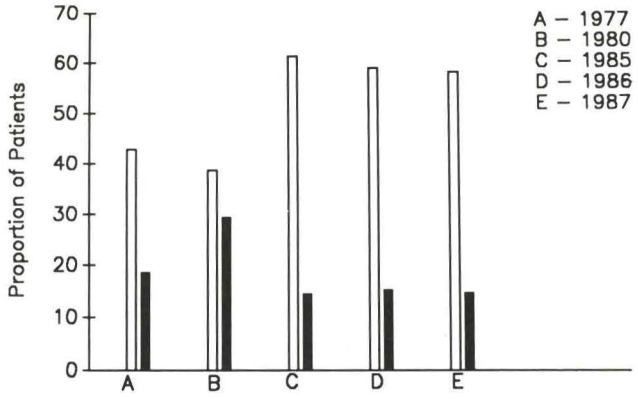

Figure 1. Distribution of simple amalgam restorations. Comparison of patients requiring no simple amalgam restorations and patients requiring three or more simple amalgam restorations. Empty bars represent the proportion requiring no simple amalgam restorations; blackened bars represent the proportion requiring three or more simple amalgam restorations.

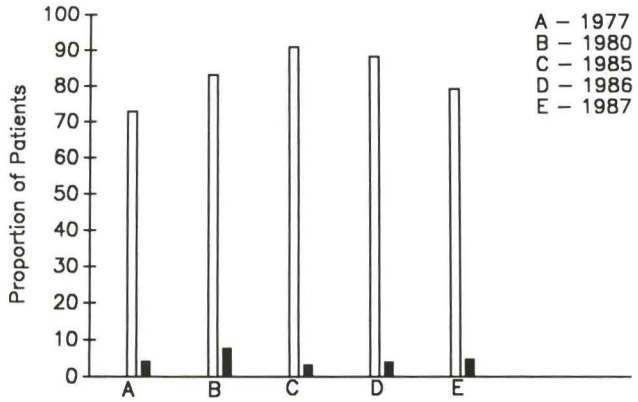

Figure 2. Distribution of stainless steel crown restorations. Comparison of patients requiring no stainless steel crown restorations and patients requiring three or more stainless steel crown restorations. Empty bars represent the proportion of patients requiring no stainless steel crown restorations; blackened bars represent the proportion of patients requiring three or more stainless steel crown restorations.

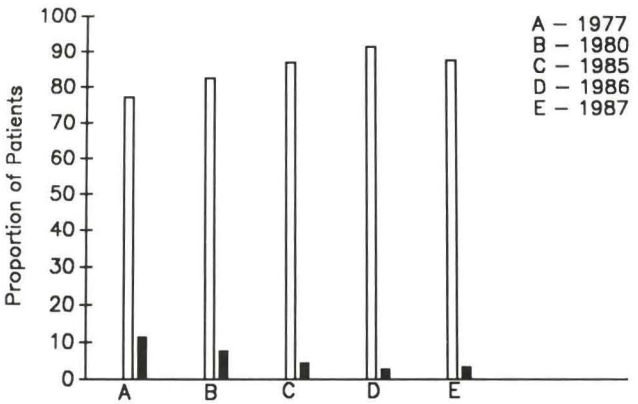

Figure 3. Distribution of vital pulpotomies. Comparison of patients requiring no vital pulpotomies and patients requiring two or more vital pulpotomies. Empty bars represent the proportion of patients requiring no vital pulpotomies; blackened bars represent the proportion of patients requiring two or more vital pulpotomies.

Differences in the percentage of patients requiring *multiple pulpotomies* versus *no pulpotomies* are presented in Figure 3. From 1977 to 1987, there is a considerable increase in the proportion of patients who did not require a pulpotomy. During this period, there was also a drastic decline in the proportion of patients requiring multiple pulpotomies.

DISCUSSION

This analysis of clinical procedures accomplished on first graders from four inner city school districts demonstrates that a change in the pattern of treatment occurred during the period from 1977 to 1987. There was a precipitous decline in the proportion of patients requiring amalgam restorations. In 1987, fewer than 15 percent of this pediatric population required complex amalgam restorations. Ten years ago, 60 percent of this population required such treatment. These findings agree with the analysis of the pediatric patient population at the University of Iowa.[9] They also echo the numerous reports from other dental schools of decreased numbers of amalgam restorations among their pediatric population.[5,10]

The results, which compare other forms of restorative treatment provided these patients, during this decade, also indicate changes. From 1977 to 1987, there is a slight decline in the percentage of patients requiring stainless steel crowns. A similar decrease is noted in the proportion of patients requiring formocresol pulpotomies. It is interesting, however, that, in spite of this decline, in 1987 more than 20 percent of this urban pediatric population required stainless steel crown restorations and as many as 10 percent still require formocresol pulpotomies.

The comparison of the percentage of children requiring multiple operative procedures illustrates some interesting differences during this decade of observation. In contrast to the precipitous decline in the proportion of patients requiring simple amalgam restorations, there has been little change in the fraction who required multiple simple amalgam restorations. Furthermore, the segment of this pediatric population requiring multiple stainless steel crowns has remained relatively constant between 4 percent and 5 percent. These findings suggest that there is still a small number of our pediatric patients who require extensive care as a result of dental caries. Similar conclusions have been presented by Graves and Stamm in 1985 and Ripa in 1986.[2,10]

This evaluation of the patterns of dental treatment provided for children from four inner city school dis-

tricts, shows dramatic changes over this decade. It is interesting that some of the benefits of water fluoridation, fluoride dentifrices, and other preventive techniques can be recorded in this largely underserved segment of our pediatric dental population. Although restorative needs of this population have decreased since 1977, there is still a significant fraction of these patients who require complex care and treatment as a result of dental caries.

By expanding this program to include more of the inner city elementary schools, undergraduate dental students may still realize the opportunity to complete such procedures as stainless steel crowns and pulpotomies. This fifty-eight-year old program has been a workable and durable community service; and now in the face of a declining dental caries rate, it contributes significantly to the student's experience in undergraduate clinical pediatric dentistry.

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ETHICS IN PRACTICE

As the 1990s overtake us, public interest in ethics is at a historic high. While the press calls attention to blatant derelictions on Wall Street, in the defense industry, and in the Pentagon, and to questionable activities in the White House, in the attorney general's office, and in Congress, observers wonder whether our society is sicker than usual. Probably not. The standards applied to corporate behavior have risen over time, and that has raised the average rectitude of businesspersons and politicians both. It has been a long time since we could say with Mark Twain that we have the best Senate money can buy or agree with muckrakers like Upton Sinclair that our large companies are the fiefdoms of robber barons. But illegal and unethical behavior persists, even as efforts to expose it often succeed in making its rewards short-lived.

Why is business ethics a problem that snares not just a few mature criminals or crooks in the making but a host of apparently good people who lead exemplary private lives while concealing information about dangerous products or systematically falsifying costs? My observation suggests that the problem of corporate ethics has three aspects: the development of the executive as a moral person; the influence of the corporation as a moral environment; and the actions needed to map a high road to economic and ethical performance—and to mount guardrails to keep corporate wayfarers on track.

Andrews, K.R.: Ethics in practice.
Harvard Business Review, 67:99-104, September-October, 1989.

Ectopic eruption of first permanent molars: report of case

Case report

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Ectopic eruption of maxillary first molars represents a significant developmental disturbance in the transitional dentition. This condition is manifested by the maxillary permanent first molar continuing to erupt mesially to its normal path and resorbing the distal buccal root of the primary second molar.

Chapman first reported ectopic eruption of first permanent molars in 1923.[1] Young described two types of ectopic eruption.[2] In the "hold case", irreversible ectopic eruption, resorption of the roots of the primary second molar and the mesial inclination of the permanent first molar are so severe that the first molar gets trapped under the primary molar and will not erupt without treatment. In the "jump case", reversible ectopic eruption is typified by a less severe condition in which the permanent molar frees itself from under the primary molar and erupts into its normal position without intervention. Young reported further that the prevalence of this condition is greater in boys than in girls, and that ectopic eruption can occur anywhere in the mouth. The maxillary first molars, however, are the most commonly affected teeth. She also observed that maxillary-first-molar ectopic eruptions occur in all types of occlusions, although Class I occlusions had the highest prevalence. Reports in the literature show an over-

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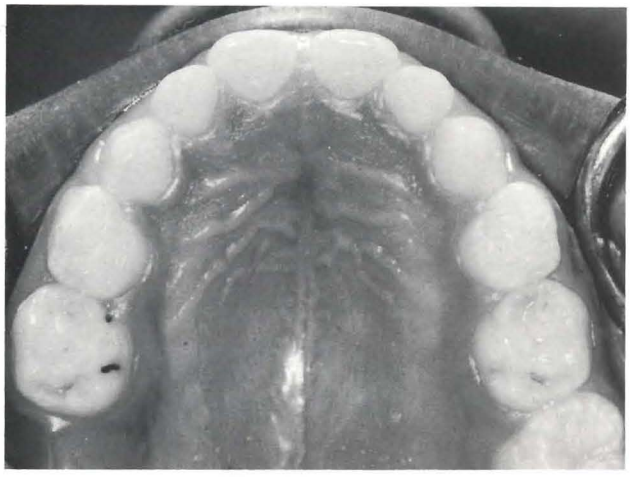

Figure 1A. Pretreatment maxillary occlusal view.

Figure 1B. Pretreatment mandibular occlusal view.

Figure 2A. Bitewing radiograph illustrates self-corrective ectopic eruption of right maxillary permanent first molar.

Figure 2B. Left maxillary permanent first molar erupting ectopically with extensive root resorption of left maxillary primary second molar.

all prevalence of ectopic eruption varying from two to six percent in children examined.[3]

An extensive study of the etiology and prevalence of ectopic eruption of the maxillary first permanent molars was reported by Pulver in 1968.[4] He found that no single etiologic factor was common to all patients and the condition arises from an interplay of several factors, which include:

- ☐ Larger than normal mean sizes of all maxillary primary and permanent teeth.
- ☐ Larger affected first permanent molars and second primary molars.
- ☐ Smaller maxillae.
- ☐ Posterior position of the maxilla in relation to the cranial base.
- ☐ Abnormal angulation of eruption of the maxillary first permanent molar.
- ☐ Delayed calcification of some affected first permanent molars.

Most frequently, ectopic eruption of maxillary first permanent molars is detected during a routine radiographic examination. The majority of patients experience no discomfort and are unaware of the discrepancy. If, however, the resorption of the primary second molar is severe, there may be a resultant perforation of the epithelial attachment. This perforation can allow the ingress of oral fluids and cause pulpal inflammation of the primary tooth.[5,6]

Bjerklin and Kurol noted that by seven years of age most permanent molars that will free themselves and erupt normally will have already done so.[7]

The most efficacious methods of treating ectopic eruption center on the concept of guiding the permanent molar into its normal eruption position, while maintaining the integrity and function of the primary second molar. Treatment modalities can be divided into two broad categories: interproximal wedging and distal tipping therapies.[8] Interproximal wedging techniques

Figure 3A. Left maxillary permanent first molar exposed by electrocautery.

Figure 3B. A modified Humphrey appliance provided a distally directed force on the left maxillary permanent first molar.

involve utilizing a ligature wire, orthodontic separating spring, or separating elastic wedged at the contact of the ectopic first permanent molar and the second primary molar. These methods cause separation of the two teeth and allow the permanent molar to move into proper position. When interproximal wedging devices are not feasible because of the severity of the ectopic eruption, distal tipping of the first permanent molar becomes necessary.

In 1962, Humphrey described his technique for correction of ectopically erupting first permanent molars.[9] A wire soldered to the banded second primary molar provided a distally directed force to the permanent first molar. Several other techniques for the treatment of ectopically erupting permanent first molars have been reported.[10-14]

REPORT OF CASE

A five-year, eleven-month-old black female presented to the pediatric dental clinic for treatment. Her medical history was noncontributory and the extraoral findings were within normal limits. A clinical dental examination showed three permanent first molars had erupted, whereas the left maxillary first permanent molar (#14) was unerupted (Figures 1 A,B). It is interesting

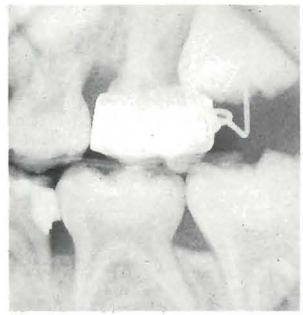

Figure 4A. Bite-wing radiograph made on the day the appliance was delivered.

Figure 4B. Bite-wing radiograph illustrates the extend of root resorption on the left maxillary primary second molar and the eruption of the left maxillary permanent molar into occlusion.

to note that a self-corrective ectopic eruption had occurred with the right maxillary first permanent molar (#3) (Figure 2A). It was noted radiographically, however, that #14 was erupting ectopically and extensive root resorption of the left maxillary second primary molar (#J) had occurred (Figure 2B).

The treatment plan for this patient consisted of using electrocautery to expose #14 and adapting a band on #J at the same visit (Figure 3A). A modified Humphrey appliance was cemented eleven days postsurgery, after a resin "stop" was provided on the exposed occlusal surface of #14 (Figure 3B). The wire was activated 2.0 mm to provide a distally directed force on #14. A bite-wing radiograph was made at this time (Figure 4A). After five months, the appliance was removed and the mesial marginal ridge of #14 had cleared the undercut of #J. It should be noted that to insure a proper distally directed force, the wire was reactivated several times during the course of treatment. Although a significant defect caused by the resorption of #J was noted radiographically, two months after removal of the appliance this tooth was not appreciably mobile and #14 continued to erupt (Figure 4B). The parent was cautioned that should the primary second molar not be retained until its natural exfoliation and eruption of the second premolar, a space maintainer would need to be fabricated at a later date.

This case demonstrates a method to treat effectively a severe ectopically erupting permanent maxillary first molar that had not yet erupted into the oral cavity. Using an electrocautery technique and a modified

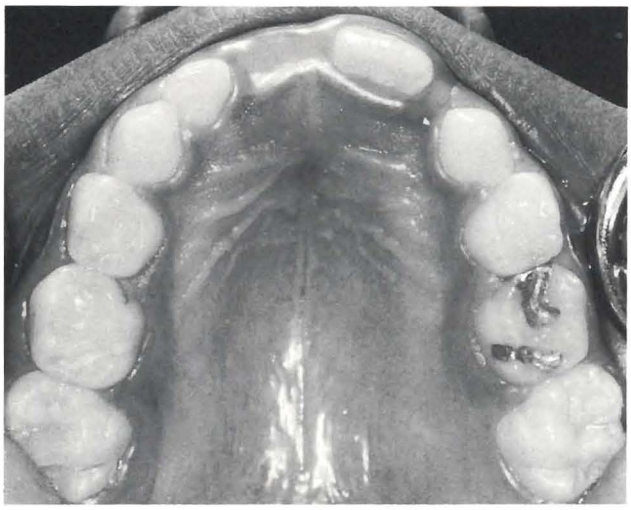

Figure 5A. Posttreatment maxillary occlusal view.

Figure 5B. Posttreatment mandibular occlusal view.

Humphrey appliance, the ectopic eruption was corrected while retaining the primary second molar (Figures 5 A,B).

Every effort should be made to move an ectopically erupting first permanent molar distally and allow it to erupt in its normal position. The technique described has been used effectively in several patients.

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INFLUENCE OF FAMILY AND PEERS ON DIETING BEHAVIOR

In a study of dieting behavior and eating attitudes of children, the question of the influence of family and peers was included. A large percentage of children reported mothers who have dieted at some time (69 percent). In addition, 13 percent described their mothers as overweight, and 18 percent described their fathers as overweight. A total of 15 percent of the children responded that their friends would like them more if they were thinner, indicating that peer pressure to diet may not be strong with this age group.

Maloney, M.J. *et al*: Dieting behavior and eating attitudes in children. Pediatrics, 84:482-489, September, 1989.

ABSTRACTS

Kaba, Aysin D. and Maréchaux, Sabin C.: A fourteen-year follow-up study of traumatic injuries to the permanent dentition. J Dent Child, 56:417-425, November-December, 1989.

The frequency of traumatic injuries to permanent teeth was studied in a Swiss population sample consisting of 262 children. The prevalence of injuries was 10.81 percent. The children (106 girls and 156 boys) ranged in age from 6-18 years; the boy/girl ratio was 1.47:1. The largest number of injuries for boys was found between the ages of 9 and 10 years. The teeth most commonly injured were the maxillary central incisors (80 percent), and the most frequent type of injury was an enamel-dentin fracture without pulp exposure (53 percent). After the emergency treatment, 42 percent of the patients were followed for study from as early as one month up to 9 years. The recall evaluations show that the prognosis was extremely favorable for enamel fractures only, while pulp necrosis developed in 11.8 percent of the enamel-dentin fractures. Fourteen percent of the traumatic injuries were luxation injuries and, of these, 46 percent required endodontic therapy.

Injuries, traumatic; Tooth fracture; Enamel; Dentin; Luxation

Avram, Daniel C. and Pulver, Franklin: Pulpotomy medicaments for vital primary teeth. J Dent Child, 56:426-434, November-December, 1989.

The topic of pulpal medicaments and techniques for vital primary teeth is naturally of interest to dentists treating a pediatric population. A broad overview of the techniques that are currently practiced and taught has been lacking in the literature. To evaluate the use of and attitudes toward the various materials used in the course of vital pulpal therapy on primary teeth, questionnaires were sent to all members of the Canadian Academy of Pediatric Dentistry, to dental schools in Canada, the United States and to selected dental schools worldwide. The preferred pulpotomy medicament of Canadian pediatric dental specialists was the 1:5 formocresol dilution; the most

prevalent medicament used in pediatric dental department of dental schools was full-strength formocresol. Scandinavia was the only geographic region in which calcium hydroxide was preferred as the medicament for pulpotomy. Although there was concern expressed about the potential harmful effects of formocresol, this did not translate into a corresponding willingness to change to another medicament. It was apparent that the current state of research was not sufficient to persuade the majority of practitioners or schools that a satisfactory alternative had been developed.

Formocresol; Formaldehyde; Glutaraldehyde; Pulpotomy; Survey

Waldman, H. Barry: Fetal alcohol syndrome and the realities of our time. J Dent Child, 56: 435-437, November-December, 1989.

A review is provided of the impact of fetal alcohol syndrome (FAS) and the realities of the consumption of alcohol by women. The worldwide incidence of FAS is 1.9 per 1,000 live births. FAS is recognized as the leading cause of mental retardation in the West, in addition to producing a constellation of birth defects. One in six women of childbearing age drinks enough alcohol to jeopardize a developing fetus. Warning labels on alcohol should be considered to publicize the dangers to the fetus.

Ethanol; Alcohol drinking; Childbearing; Mental retardation; Birth defects; Fetal alcohol syndrome

Wood, A. Jeffrey; Saravia, Mario E.; Farrington, Frank H.: Cotton roll isolation versus Vac-Ejector® isolation. J Dent Child, 56:438-441, November-December, 1989.

A visible-light-cured, white pit-and-fissure sealant was applied to 523 teeth in school children using either cotton rolls or a VacEjector® for isolation. After a minimum of six months, the patients were recalled and the retention of the sealants was evaluated. No significant difference in sealant retention was found between the two isolation methods.

Pit-and-fissure sealant; Isolation; Cotton rolls; Vac-Ejector®

Samaranayake, L.P.; Reid, J.; Evans, D.: The efficacy of rubber dam isolation in reducing atmospheric bacterial contamination. J Dent Child, 56:442-444, November-December, 1989.

This study ascertained the efficacy of rubber dam isolation in controlling atmospheric bacterial contamination when conservative pedodontic procedures are performed. There was a highly significant ($p < 0.001$) reduction in bacterial contamination of the atmosphere, perioperatively, when rubber dam isolation was used. Reduction in bacterial aerosols was greatest at one meter from the headrest.

Rubber dam; Infection control; Bacteria, airborne

Katz, Ronald W.: An analysis of compound and complex odontomas. J Dent Child, 56:445-449, November-December, 1989.

Three hundred ninety-six odontomas were included in this study, with each case assigned to one of three categories using commonly accepted histologic criteria for compound and complex forms. Analysis revealed that compound odontomas were the most common type (70 percent of all cases). They were most common in the 11 to 15-year-old age-group and in the maxillary incisor area or the canine regions of either jaw. There was a nearly equal sex distribution. Complex odontomas showed similar age and sex distribution; they had a greater tendency to occur in the molar regions. Complex odontomas were also associated with unerupted teeth more often than compound odontomas. Tooth agenesis in the area of an odontoma or the impaction of a primary tooth by an odontoma occurred infrequently. This study showed that there is a correlation between the site of an odontoma and the age at which it is generally treated.

Odontoma, compound, complex, or mixed; Histology, dental; Pediatric dentistry; Dental treatment

Faine, Robert C. and Isman, Robert: The use of dental sealants in the Washington State Medical Assistance Program: a second-year report. J Dent Child, 56:450-451, November-December, 1989.

Overall, there were 21,685 teeth sealed in Washington State during the second year of the Medical Assistance sealant program, representing an average of 3.18 teeth sealed per child. Of the total of 39,677 children who made at least one visit to the dentist between November 1986 and October 1987, 6,814 (17.2 percent) received sealants in their first or second permanent molars. Costs were up 12 percent, to $193,303. There were 726 participating dentists in the sealant program, a 22 percent increase over the first year of the project.

Pediatric dentistry; Early and Periodic Screening Diagnosis and Treatment program/Washington State; Sealants

Boj, Juan R. and Davila, Jorge M.: A study of behavior modification for developmentally disabled children. J Dent Child, 56:452-457, November-December, 1989.

A tape-slide series, using a desensitization and modeling approach, was developed in order to prepare three- and four-year-old developmentally disabled children for an initial dental examination. The tape-slide series pleasantly describes what to expect during the first visit to the dental office. A clown and a four-year-old girl were used as models. Twenty-eight children participated in the study, divided into two groups: control and experimental. A requirement for qualification as a patient was that the child not have had any previous dental experience. Three techniques for measuring behavior were used: heart rate, a modified Melamed's scale, and a dentist's subjective evaluation. The results demonstrated that: a) The experimental group was in a high state of arousal when starting the dental procedures; b) Children exposed to the tapeslide series showed worse behavior and a higher heart rate than

Continued on page 474

tween the two? An information, education and awareness raising campaign is one of the most important elements of the Day.

In spite of a flood of information - all too often contradictory - the message has still not reached many people throughout the world that, on the eve of the 21st century, 1.7 billion people still lack access to safe water and 1.2 billion do not have adequate sanitation facilities. A great deal of suffering and most of the deaths in developing countries can be directly traced to water-borne and water-related diseases.

Chemical pollution of the atmosphere, the soil and the water is a universal process that cannot help but affect our health. The latest WHO data show that well over one billion people live in urban areas where the annual average of air pollution is unacceptably high. As always, children, the elderly and pregnant women are at added risk. These are only two examples of the interaction between the environment and health. So is there no light at the end of the environmental tunnel? Well, there is always hope. Every little effort helps! Some countries only allow cars on the road on even dates with even license-plate numbers, thus halving the number of vehicles on the road. Some communities organize "planta-tree" campaigns, or ban the further spread of chlorofluorocarbons (CFCs) chemicals used in refrigerators or aerosols, but deadly for the environment. Individuals can make sure they stick strictly to instructions when handling pesticides, or make a fuss with the authorities about litter or unsightly waste disposal. WHO invites everyone to think now about what can be done on 7 April 1990 to help to protect the environment. All over the world, people, communities and countries will be marking the Day in striking and effective ways. World Health Day 1990 can be a truly global event with plenty of local action and ingenuity. By being responsible toward the environment and our own health, we are taking care not only of ourselves but also of the generations to come.

LETTERS

INTERCEPTIVE ORTHODONTICS DEFINED

☐ I recently read in the September ASDC Newsletter that new collateral material has been fabricated for distribution to its members by the Society, and one of the new ones was one that included interceptive orthodontics. The cover of this brochure defined interceptive orthodontics as "a means of treating less severe bite problems at an early age by relatively simple procedures. Nothing the dentist does for a child contributes more to the child's normal appearance and dental function, at low cost." Personally, I feel the wording of this gives a vastly incorrect perception of what interceptive orthodontics is. Perhaps the most eloquent definition of interceptive orthodontics was give by Robert M. Ricketts, DDS, MS who defined interceptive orthodontics as a phase of orthodontics that corrects the form and function of the growing craniofacial complex. It was due

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children not exposed to the series; c) Heart rate was sensitive and objective in measuring anxiety and arousal in the dental setting; d) Modified Melamed's scale was not sensitive enough to measure microbehavior in this study; e) The subjective dentist's evaluation showed the impossibility of preventing a biased interpretation of behavior by the evaluator.

Children, disabled, developmental; Anxiety, dental; Behavior scale; Heart rate; Evaluation, subjective

Waldman, H. Barry: 1980-1990: What a difference ten years have made in the future of pediatric dental practice. J Dent Child, 56:458-462, November-December, 1989.

A review is provided of developments in pediatric dentistry during the 1980s. In the early part of this decade, a number of factors produced a verified oversupply of pedodontists together with a declining population younger than eighteen years of age. Decreases in dental caries became widespread. Now, a decade later the increase in total number of dentists is slowing and the ratio of dentists-to-population has begun to decline.

Manpower, dental; Pediatric dentistry

Spencer, Paulette; Bohaty, Brenda; Haynes, John I.*et al*: Change in dental treatment needs in an urban pediatric population, 1977 to 1987. J Dent Child, 56:463-466, November-December, 1989.

Decreasing caries activity in children has adversely affected the education programs in clinical pediatric dentistry. This paper presents a program designed to facilitate the educational requirements of undergraduate dental students as it meets the dental needs of an urban pediatric population in Kansas City, MO. Changes in dental treatment needs that have occurred in this population over the past decade are evaluated. Dental records of 760 children from four urban schools were examined; data from the dental records were categorized according to the type and number of operative procedures completed. Results indicated a significant decrease in the percentage of patients requiring simple or complex amalgams from 1977 to 1987. Similar decreases were noted in other operative procedures. However, comparisons between the proportion of patients requiring multiple operative procedures indicate less change during the ten-year period. These results suggest that there is still a percentage of patients requiring substantial dental care as a result of dental caries.

Demography; Dental education; Epidemiology; Underserved areas; Pediatric dentistry; Dental caries; Operative dentistry