

... *Yes, young people may not like us when we set rules and standards, and that is too bad. When we worry about our children liking us, however, we put our needs ahead of our children's needs. When we try to be pals with our children instead of parents, we deprive them of their most important source of internal rules, limits, standards, and controls. Our abrogation of the responsibilities of adulthood is the single most powerful contributor to the new imbalance and to the stress that imbalance puts on children.*

*A second action we can take is to attend to, and appreciate, each child's uniqueness. This was much easier to do in the modern era, when children were regarded as innocent, than it is today, when children are regarded as competent. The notion of*

*competence suggests the possession of skills and knowledge that can be assessed and compared to some external standard.*

*Too many parents and too many educators today are so concerned about the age at which their children begin reading, or doing math, or using the computer that they sometimes miss the child for the skills. It is in this way that we have narrowed the range of normality for children both at home and at school.*

—David Elkind

TO AN EXTENT WE RARELY REALIZE, IT IS CHILDREN  
THAT GIVE MEANING TO ADULT LIFE.

—Mihaly Csikszentmihalyi



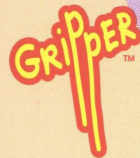
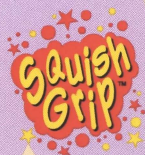


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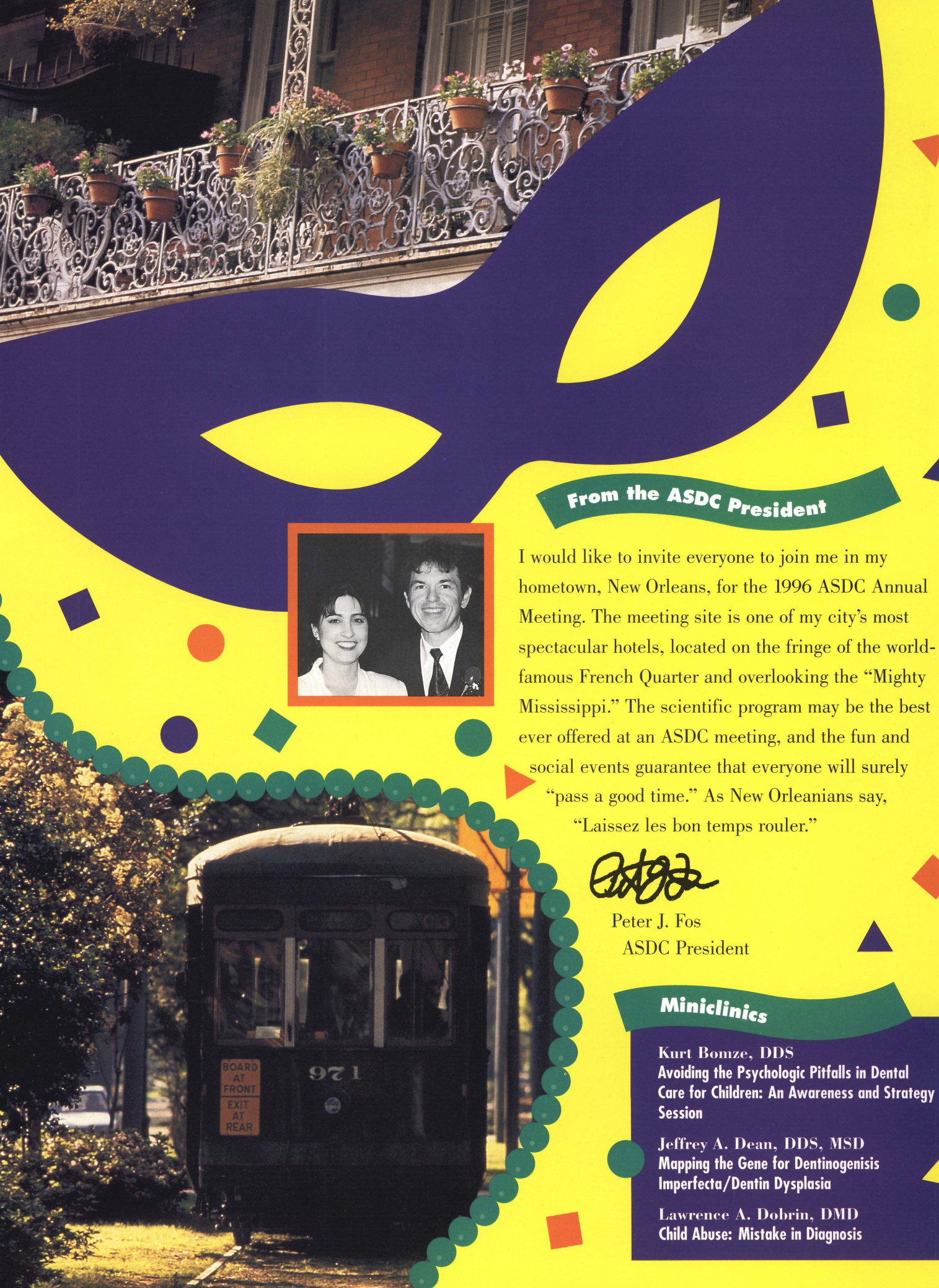
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## From the ASDC President



I would like to invite everyone to join me in my hometown, New Orleans, for the 1996 ASDC Annual Meeting. The meeting site is one of my city's most spectacular hotels, located on the fringe of the world-famous French Quarter and overlooking the "Mighty Mississippi." The scientific program may be the best ever offered at an ASDC meeting, and the fun and social events guarantee that everyone will surely "pass a good time." As New Orleanians say, "Laissez les bon temps rouler."

Peter J. Fos  
ASDC President

## Miniclinics

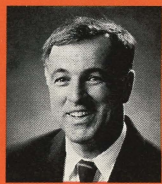
Kurt Bomze, DDS  
Avoiding the Psychologic Pitfalls in Dental Care for Children: An Awareness and Strategy Session

Jeffrey A. Dean, DDS, MSD  
Mapping the Gene for Dentinogenesis Imperfecta/Dentin Dysplasia

Lawrence A. Dobrin, DMD  
Child Abuse: Mistake in Diagnosis



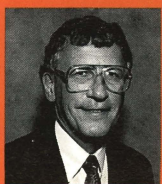
## Scientific Program Speakers



**Leonard J. Carapezza, DMD**

"Space-Age Children's Dentistry: Early Diagnosis and Treatment of Malocclusion"—Dr. Carapezza is associate of the New England Medical Center, an assistant clinical professor at Tufts

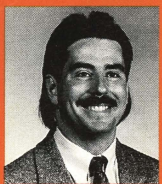
University School of Dental Medicine, and in private practice in Wayland, Massachusetts. His presentation emphasizes the importance of diagnosing and treating present and potential malocclusions.



**C. Richard Bennett, DDS, PhD**

"Pediatric Anesthesia Update"—Dr. Bennett is professor and chair of the Department of Anesthesiology at the University of Pittsburgh School of Dental Medicine and serves as senior staff

anesthesiologist at the Eye & Ear Institute Pavilion of the University of Pittsburgh Medical Center. His presentation will briefly review recent developments in pain theory and methods for pain and anxiety control including local anesthesia, conscious sedation and dissociative sedation. Pharmacology of local anesthetics including their role as allergens and their ability to produce toxic effects on the central nervous and cardiovascular systems will be stressed.



**Kevin J. Donly, DDS, MS**

"Contemporary Use of Glass Ionomer Cement in Pediatric Dentistry"—Dr. Donly is associate professor, Department of Pediatric Dentistry, associate director, Center for Clinical Studies, College of

Dentistry, and Dows Institute for Dental Research, at the University of Iowa. His presentation will cover the clinical utilization of glass ionomer cements in contemporary restorative dentistry. Uses include posterior and anterior bases/liners and restorations and the advantages and disadvantages of available types. Instances of preference of glass ionomer cement over dentin bonding resin will be discussed.



## Breakfast with the Experts



**Martin J. Davis, DDS**, is dean for Student and Alumni Affairs and division director of Pediatric

Dentistry at Columbia University. His topic is "The Future of Children's Oral Health Care."



**William R. Posnick, DDS, MS, MPH**, will present "A Retrospective Look

at Treatment Decisions Made while Providing Care under General Anesthesia." Dr. Posnick is in private practice in Galveston, Texas, and is clinical professor of surgery at the University of Texas Medical Branch in Galveston.



**Robert J. Musselman, DDS, DMD**, will present "New Restorative Techniques and

Materials for the Treatment of Children." Dr. Musselman is

professor and head of the Department of Pediatric Dentistry at LSU School of Dentistry.



**Jimmy R. Pinkham, DDS**, is professor and chair of the Department of

Pediatric Dentistry at the University of Iowa. Dr. Pinkham's topic will be "Teaching the Impossible: Child Patient Management in Litigious Times."



**John E. Nathan, DDS, MDS**, will discuss "Pediatric Conscious Oral

Sedation: What's Safe and What Works?" Dr. Nathan is clinical associate professor, Division of Pediatric Dentistry, Northwestern University. He is also on faculty with several Chicago-area healthcare institutions, as well as in private practice in pediatric dentistry.

**Clifton O. Dummett, Jr., DDS, MSD, MEd** Pulp Therapy in Pediatric Dentistry: Pulpotomy Options

**Margaret A. Elliott, DDS, MPH** Pierre Robin Sequence: Prevalence and Treatment of Selected Medical and Dental Combinations

**Peter J. Fos, DDS, MPH, PhD** Managed Care: Friend or Foe?

**Diana M. Gardiner, PhD** NCAA Mouthguard Regulations: Do They Work? A Summary of Coaches' and Referees' Opinions

**James F. Gardiner, DDS, MPH, MEd** A History of Dentistry in New Orleans

**Eric J. Hovland, DDS, MEd, MBA** Developments in the Management of Traumatic Injuries to Teeth

**Francis G. Serio, DMD, MS** International Volunteer Dentistry: The Icing on the Cake

**Deborah Studen-Pavlovich, DMD** Pediatric Dental Prevention Update

**Edward D. Williams, DMD** Have Mouthguards Failed Our Children in Sports?



## Continuing Education Credit

The American Society of Dentistry for Children is an ADA CERP Recognized Provider. AGD Approved National Sponsor; FAGD/MAGD Credit; 04/17/1993 to 12/31/1999. Full attendance at this meeting will earn attendees 16 hours of continuing education credit.

## Program Schedule

### Tuesday, October 22

8:00 am - 12:00 pm  
Executive Committee Meeting

1:00 pm - 5:00 pm  
Board of Trustees Meeting

### Wednesday, October 23

7:30 - 8:00 am  
Continental Breakfast (Board Members)

8:00 am - 5:00 pm  
Board of Trustees Meeting

1:00 pm - 5:00 pm  
Registration Desk Open

### Thursday, October 24

6:30 am - 2:00 pm  
Registration Desk Open

7:00 - 8:15 am  
Breakfast with the Experts

8:30 - 11:00 am  
Scientific Session:  
Dr. Bennett—"Pediatric Anesthesia Update"

11:15 am - 1:45 pm  
Scientific Session:  
Dr. Donly—"Contemporary Use of Glass Ionomer Cement in Pediatric Dentistry"

6:30 - 8:30 pm  
Welcome Reception/  
Dinner "Mardi Gras:  
A Taste of New Orleans"  
(cash bar)

### Friday, October 25

6:30 am - 1:30 pm  
Registration Desk Open

7:00-8:45 am  
Table Clinics  
(continental breakfast)

### Friday, continued

9:00 am - 1:00 pm  
The Samuel D. Harris Lecture: Dr. Carapezza—"Space-Age Children's Dentistry: Early Diagnosis and Treatment of Malocclusion"

6:30 - 8:00 pm  
McBride Society Reception—The Plimsoll Club, World Trade Center (by invitation only)

### Saturday, October 26

7:00 am - 1:00 pm  
Registration Desk Open

7:00 - 8:15 am  
Fellows/Masters/Past Presidents' Breakfast

8:30 am - 12:30 pm  
Miniclinics

12:45 - 2:00 pm  
House of Delegates

6:30 - 7:30 pm  
President's Reception (cash bar)

7:30 pm  
President's Dinner

12:30 - 3:30 pm

### 6 Jean Lafitte Swamp Adventure

Discover New Orleans' other wildlife. Enjoy a narrated sightseeing journey by boat, Cajun style, into the heart of Louisiana's beautiful and natural swamplands.

# Tours

For more tour information, contact ASDC national headquarters in Chicago. ASDC reserves the right to cancel any tour due to insufficient registration. Refer to the enclosed form for registration.

## Thursday, October 24

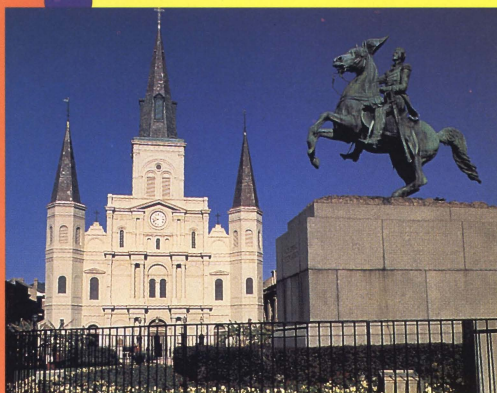
1 1:00 - 4:00 pm

**New Orleans City Tour** See for yourself how the past and present coexist in America's most European city. This narrated tour includes Creole merchant mansions nestled among 100-year-old oaks, the St. Louis III Cemetery, known as "the city of the dead," and New Orleans' fine yacht harbor.

2 2:00 - 5:00 pm

**French Quarter Antique and Art Shopping Tour** New Orleans was the richest seaport in the U.S. at the turn of the century. Today, it is a

haven for antique collectors with its esteemed galleries and shops. This three-hour walking tour will intrigue and delight shopping enthusiasts.



## Friday, October 25

3 1:00 - 5:30 pm

**Garden District Homes and Lunch** Tour two private homes from a by-gone era, stroll through the district's elegance and enjoy the world-renowned Creole cuisine of Commander's Palace.

4 7:00 - 10:00 pm

**Dinner Jazz Cruise** Experience moonlight on the Mississippi—dinner, dancing and cocktails—onboard paddlewheelers, the Cajun Queen or Creole Queen.

## Saturday, October 26

5 9:00 am - 4:00 pm

**Houmas & Nottoway Plantations with Lunch** Take a step back in time at these Greek Revival style homes from the 1800s. Enjoy lunch at Lafitte's Landing, the "Old Viala" Plantation, owned by chef John Folse of PBS's "A Taste of Louisiana" fame.

## Discounts

United Airlines is offering attendees a 10% discount off the unrestricted, mid-week coach fare, or 5% off the lowest applicable fares, including first class. This special offer applies to all domestic United Airlines, United Express and Shuttle by United flights. Call today as seats may be limited. United's toll-free number is 800/521-4041. Please refer to ASDC's meeting ID number 568MZ.

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## BROCHURE TOPICS

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Emergency First Aid for Teeth  
Sealants Prevent Dental Decay  
X-raying Children's Teeth  
The Dental Benefits of Fluorides  
Periodontal Disease in Children  
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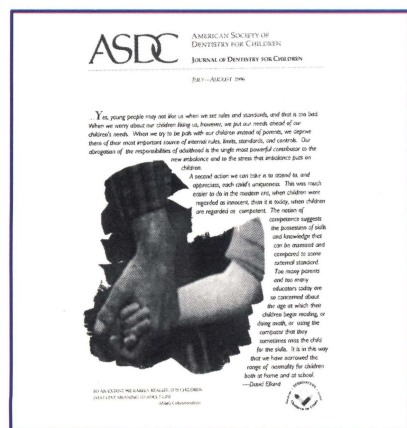
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Prospective authors should consult "Information for Authors." Reprints of this document may be obtained from the Editorial Office.

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Parents should provide their children with internal rules, limits of behavior, standards, and controls. In addition they should recognize each child's uniqueness.

Art and design by Sharlene Nowak-Stellmach

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## CLINIC

- 249 Effects of carbamide peroxide whitening agents on enamel surfaces and caries-like lesion formation: An SEM and polarized light microscopic in vitro study**

Catherine M. Flaitz, DDS, MS; M. John Hicks, DDS, MS, PhD, MD

*Use of carbamide peroxide agent for prolonged periods has become the standard method of tooth whitening.*

- 257 Risk factors associated with acute dental pain in children**

Robert E. Primosch, DDS, MS, MED; Donna L. Nichols, DMD; Frank J. Courts, DDS, PhD

*The purpose of this study was to identify risk factors derived from a child's clinical and radiographic examinations that would help to predict subsequent postoperative pain, following primary-tooth extractions.*

- 261 Bond strength of light cured glass ionomers to carious primary dentin**  
Jon L. Way, DDS, MS; Angelo A. Caputo, PhD; Joseph R. Jedrychowski, DDS, MS

*The purpose of this study was to determine the effect of artificial dentin decay and a pretreatment with a polyacrylic acid solution on the shear bond strengths of two light-cured glass ionomer materials.*

- 265 Comparison of retentive qualities of two glass-ionomer cements used as fissure sealants**

K.J. Weerheijm, DDS, PhD; C.M. Kreulen, DDS, PhD; R.J.M. Gruythuysen, DDS, PhD

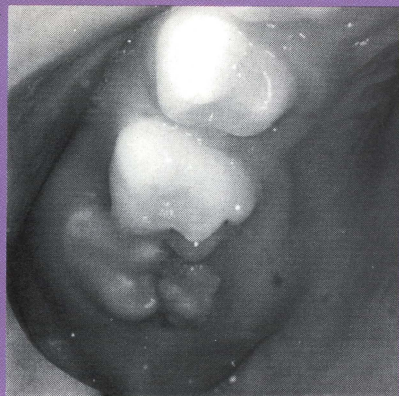
*The purpose of this study was to compare the retention rates of a glass ionomer cement designed as a sealant material with the glass-ionomer cement used as a restorative material.*

- 268 The effectiveness of sealants in pediatric patients**

Jerry Walker, DDS, MA; Kevin Floyd, DDS; Jane Jakobsen, MA

*The purpose of this study was to review the history of sealants in permanent molars placed in the University of Iowa's Pediatric Dentistry Clinic from 1985 to 1993.*





## NURSING CARIES

### 271 Parents and nursing-bottle caries

Ton van Everdingen; Michael A.J. Eijkman, DDS, PhD; Johan Hoogstraten, PhD

*The purpose of this explorative study was to map the dental factors and the psychological forces involved in nursing-bottle caries.*

## ABUSE

### 275 A study of age-related variables among physically abused children

Stephen A. Jessee, DDS; Monty Rieger, MS, PhD

*The authors present information, obtained in a retrospective hospital study, regarding certain age-related variables among children who were suspected or known to have been physically abused.*

## HEALTH EDUCATION

### 281 Using a children's dental health carnival as a primary vehicle to educate children about oral health

Stanton D. Harn, PhD; David G. Dunning, PhD

*The purpose of this study was to present findings of a survey, to provide insight regarding the benefits of using a carnival as a primary educator of dental health for children.*

## DEMOGRAPHICS

### 285 Mid-1990s profile of U.S. children and the conditions in which they live

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

### 291 Uninsured children and adults

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

### 295 Your next pediatric patient may not be getting needed child support payments.

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

## REPORT

### 299 Delayed eruption of a permanent molar associated with a complex odontoma: Report of case

Ali Salehi Rad, DDS; James Reid, BDS, FDS, PhD

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#### Calendar

1996

ASDC Annual Meeting, Westin Canal Place, New Orleans, LA, October 23-27  
ASDC Regional Seminar, September 7, La Mansion del Rio, San Antonio, TX 78205  
VIII Latin American Congress of Pediatric Dentistry, August 28-31, Lima, Peru  
Evolving Issues in Child Behavior Management: Legal, Ethical, and Practical Considerations. The University of North Carolina, October 18.

1997

ASDC Annual Meeting, Registry Resort, Naples, FL, October 22-26



# For The Busy Reader

## **Effects of carbamide peroxide whitening agents on enamel surfaces and caries-like lesion formation: An SEM and polarized light microscopic in vitro study—page 249**

During the late 1980s, several practitioners observed that a carbamide peroxide antiseptic, used for treatment of soft tissue injury, aphthous ulcers, and as a generalized oral tissue cleansing agent after oral or periodontal surgery, resulted in demonstrable whitening of tooth enamel, especially when delivered in a custom-fitted tray. In the form of a viscous gel, carbamide peroxide has been adapted for dentist-prescribed/home-applied vital tooth whitening.

Requests for reprints should be sent to: Dr. Catherine M. Flaitz, Division of Oral Pathology, Dental Branch, University of Texas-Houston Health Science Center, 6516 John Freeman Avenue, Houston, TX 77030.

## **Risk factors associated with acute dental pain in children—page 257**

The problem of acute pain management in children centers on the difficulty of assessing their pain objectively, because of their limited ability to understand instructions regarding that assessment, and to articulate descriptions of their pain. The purpose of this study was to identify risk factors derived from a child's clinical and radiographic examinations that would help to predict subsequent postoperative pain, following extractions of primary teeth.

Requests for reprints should be sent to: Dr. Robert E. Primosch, Department of Pediatric Dentistry, University of Florida College of Dentistry, P.O. Box 100426, Gainesville, FL 32610-0426.

## **Bond strength of light-cured glass ionomers to carious primary dentin—page 261**

Glass ionomer materials have more desirable characteristics than conventional liners and bases. The desirable qualities include fluoride release, biocompatibility, and adhesion to enamel and dentin. Rapid temporary treatment of early childhood caries or baby bottle tooth decay

may allow the child to mature and accept dental treatment later. Finding the optimum glass ionomer system would enable dentists to place temporary fillings on carious dentin with confidence.

Requests for reprints should be sent to: Dr. Joseph R. Jedrychowski, Professor of Pediatric Dentistry, UCLA School of Dentistry, Center for Health Sciences, Los Angeles, CA 90095-1668.

## **Comparison of retentive qualities of two glass-ionomer cements used as fissure sealants—page 265**

The authors studied the retention rates of a glass ionomer cement designed as a sealant material with the glass ionomer restorative material, used as a sealant. The retention rate of the restorative glass ionomer was significantly better than that of the sealant material.

Requests for reprints should be sent to: Dr. K.L. Weerheijm, ACTA/Pediatric Department, Louwesweg 1 postvak 5, 1066 EA Amsterdam, The Netherlands.

## **The effectiveness of sealants in pediatric patients—page 268**

The authors reviewed the history of sealants in permanent molars placed in the University of Iowa's Pediatric Dentistry Clinic from 1985 to 1993. It is of interest to note that, when comparing the replacement of sealants placed in first permanent molars of five, six, and seven-year-old children with those placed in children eight years and above, a greater than expected rate of failure occurred in the younger groups and less than expected occurred in the older children.

Requests for reprints should be sent to: Dr. Jerry D. Walker, Department of Pediatric Dentistry, College of Dentistry, The University of Iowa, Iowa City, IA 52242.

## **Parents and nursing-bottle caries—page 271**

The purpose of this explorative study is to map not only the dental factors, but also the psychological mechanisms that are involved in nursing-bottle caries. Because of parents' crucial role in their children's early devel-



opment, their involvement is emphasized. Their styles of parenting are also discussed.

Requests for reprints should be sent to: Prof. dr. Johan Hoogstraten, Department of Social Dentistry and Dental Health Education, ACTA, Louwesweg 1, 1066 EA Amsterdam, The Netherlands.

#### **A study of age-related variables among physically abused children—page 275**

The data imply that dentists may come in contact with a significant number of abused children and need to be alert, therefore, to the signs and symptoms of this form of child maltreatment. It is the purpose of this paper to present information, obtained in a retrospective hospital study, regarding age-related variables among children who were suspected or known to have been physically abused.

Requests for reprints should be sent to: Dr. Stephen Jessee, P.O. Box 20068, Houston, TX 77225.

#### **Using a children's dental health carnival as a primary vehicle to educate children about oral health—page 281**

The authors concluded that a properly organized dental carnival can be a very effective vehicle for educating children about oral health. In this article they present findings of a survey, with the hope of providing insight regarding the benefit of using a carnival as a primary educator of dental health for children.

Requests for reprints should be sent to: Dr. Stanton D. Harn, University of Nebraska Medical Center, College of Dentistry, 40th & Holdrege, Lincoln, NE 68583-0740.

#### **Mid-1990s profile of U.S. children and the conditions in which they live—285**

The increasing numbers and diversity of the children in our communities and their living conditions demand a particular awareness by health practitioners. The mid-

decade report of the Bureau of the Census offers an opportunity to review the evolving characteristics of the patients who are served by pediatric dentists.

Requests for reprints should be sent to: Dr. H. Barry Waldman, Professor Dental Health Services, Department of General Dentistry, State University of New York at Stony Brook, Stony Brook, NY 11794-8706.

#### **Uninsured children and adults—page 291**

In the early 1990s more than half (53.6 percent) of the costs for dental services continued to be paid by patients on an out-of-pocket basis. Eight million three hundred thousand children under 18 years of age were not covered by any form of health insurance or health coverage.

Requests for reprints should be sent to: Dr. H. Barry Waldman, Professor Dental Health Services, Department of General Dentistry, State University of New York at Stony Brook, Stony Brook, NY 11794-8706.

#### **Your next pediatric patient may not be getting needed child support payments—page 295**

It would be difficult to overestimate the importance of the practitioner's awareness the evolving realities of the child's family environment.

Requests for reprints should be sent to: Dr. H. Barry Waldman, Professor Dental Health Services, Department of General Dentistry, State University of New York at Stony Brook, Stony Brook, NY 11794-8706.

#### **Delayed eruption of a permanent molar associated with a complex odontoma: Report of case—page 299**

Odontomas frequently go undetected because they are often asymptomatic, depending on size, location, and their limited growth potential.

Requests for reprints should be sent to: Dr. J. Reid, Department of Child Dental Care, Glasgow Dental Hospital and School, 378 Sauchiehall Street, Glasgow G2 3JZ, U.K.



## ABSTRACTS

**Flaitz, Catherine M. and Hicks, M. John: Effects of carbamide peroxide whitening agents on enamel surfaces and caries-like lesion formation: An SEM and polarized light microscopic *in vitro* study. J Dent Child, 63:249-256, July-August 1996.**

Whitening enamel with carbamide peroxide (CP) to remove cosmetically displeasing stains has become commonplace in dental practice. This *in vitro* study evaluated CP treatment effects on enamel surface morphology and caries-like lesion susceptibility. Tooth quarters were prepared from 10 caries-free human molars following a fluoride-free prophylaxis. The tooth quarters were assigned to the following treatment groups: 1) Distobuccal-10 percent NW gel (Nite White, Discus Dental); 2) Distolingual-10 percent PL paste (Platinum, Colgate); 3) Mesibuccal-16 percent NW gel; and 4) Mesiolingual-Control. Following the manufacturers' recommended treatment, each quarter was sectioned with one portion prepared for SEM and the other portion for caries-like lesion formation. Intact enamel surfaces were present with all treatments. Enamel prism markings with exaggerated prism peripheries and mild to moderate prism core loss were seen with both 10 percent NW and 16 percent NW gels, but was more prominent with 16 percent NW gel. Amorphous surface layers with occasional exposure of indistinct prism markings occurred with 10 percent PL paste. Body of lesion mean depths were 135 $\mu$ m control, 159 $\mu$ m 16 percent NW, 144 $\mu$ m 10 percent NW, and 122 $\mu$ m 10 percent PL. Lesion depths were significantly different ( $p < 0.05$  DMR paired design) between 10 percent PL and 16 percent NW, and between control and 16 percent NW. Whitening enamel surfaces *in vitro* with 10 percent carbamide peroxide paste containing dicalcium phosphate dihydrate (Colgate-Platinum) produced an amorphous surface layer and reduced caries susceptibility when compared

with 16 percent carbamide peroxide gel (Nite White).

**Carbamide peroxide; Whitening agent; Bleaching; Enamel; Caries; Polarized light; SEM**

**Primosch, Robert E.; Nichols, Donna L.; Courts, Frank J.: Risk factors associated with acute dental pain in children. J Dent Child, 63: 257-260, July-August 1996.**

The purpose of this study was to relate several variables (age, sex, race, number of extractions performed, dental arch, tooth position, mobility, root length, osseous resorptive defects, soft tissue inflammation, and history of preexisting pain) to the prevalence of parental report of pain in their children between forty-eight hours before (preexisting pain) and seven hours after extraction of their primary teeth (postextraction pain). Sixty-two children, ages two to ten years, were studied. The results indicated that there was no relationship between preexisting pain and the report of postextraction pain. There was a trend for females, primary molars, and presence of osseous resorptive defects to be associated with preexisting dental pain. Root length (complete root formation) and presence of adjacent soft tissue inflammation were statistically significant for preexisting pain. Chronologic age was the only variable studied that was associated with postextraction pain in these children. Although the existence of pain is difficult to assess in children, the results of this study may be useful in a clinician's decision-making process as to the need for prescribed analgesics following extraction of primary teeth.

**Pain; Preexisting pain; Postextraction pain**

**Way, Jon L.; Caputo, Angelo A.; Jedrychowski, Joseph R.: Bond strength of light-cured glass ionomers to carious primary dentin. J Dent Child, 63:261-264, July-August 1996.**

The pre-cooperative or handicapped child with decay presents a special challenge to the practitioner and may re-

quire sedation or general anesthesia. Treatment with an interim restoration may delay treatment until the child is more mature and can accept dental treatment and is a more conservative approach than sedation, extractions or general anesthesia. Glass ionomer materials have been utilized for this application, but little is known about their retention to carious dentin. The purpose of this study was to determine whether the presence of artificial dentin decay will affect the shear bond strengths of two light-cured glass ionomer materials.

VariGlass and Vitrebond glass ionomer materials were attached to carious and non-carious primary dentin surfaces and bond strengths determined. There were no significant differences in shear bond strengths between the decayed and non-decayed surfaces [ $p \leq .001$ ]. VariGlass had higher shear bond strengths than Vitrebond only after a pre-treatment with the PAA containing liquid. Pre-treatment with the liquid provided with each light-cured glass ionomer was beneficial in all instances except for Vitrebond on non-decayed surfaces.

**Glass ionomer; Dentin; Primary dentin; Bond strength; Pediatric dentistry; Artificial caries**

**Weerheijm, K.L.; Kreulen, C.M.; Gruythuysen, R.J.M.: Comparison of retentive qualities of two glass-ionomer cements used as fissure sealants. J Dent Child, 63:265-267, July-August 1996.**

Ideally, in view of rational practice management, the same GIC material may be used as a restorative material as well as a sealant material. The aim of this study is to compare the retention rates of a GIC designed as sealant material (Fuji Type IIIR,) and a glass-ionomer restorative material (Fuji Type IXR). In a clinical trial using a split mouth design, 104 children (mean age 10.4 years, s.d. 1.2) of the Centre of Youth Dental Health Paramaribo (Surinam) received 208 sealants, 104 per material. The sealants were placed in upper or lower first or



second molars by dental auxiliaries. Moisture control was achieved by cotton rolls. After four and nine months the retention of the sealants was checked clinically. For the evaluation at both times 99 molar pairs were available. After four months 46 percent of the Fuji IIIR and 72 percent of the Fuji IXR sealants showed complete retention. After nine months these percentages were 15 percent and 52 percent, respectively. In view of the study design, Relative Risks (RR), and their 95 percent confidence intervals, were calculated. Converted to chance to total absence, the chance to absence of the material for Fuji IX was about 60 percent less than that for Fuji III (four months  $RR = .44 (.25 - .80)$  and nine months  $RR = .42 (.39 - .45)$ ). In conclusion the GIC restorative material showed to be more retentive than the GIC sealant material.

#### **Glass-ionomer cements; Retention**

**Walker, Jerry; Floyd, Kevin; Jakobsen, Jane: The effectiveness of sealants in pediatric patients. J Dent Child, 63:268-270, July-August 1996.** The objective of this investigation was to determine the frequency of retreatment of sealed teeth in the Department of Pediatric Dentistry at The University of Iowa College of Dentistry for the eight years between July 1985 through July 1993. The 7,838 teeth initially sealed were reviewed and it was found that 78 percent had not required resealing or restoration and another 13.2 percent only required resealant. Sealants placed in first permanent molars in six, seven and eight-year-olds required more retreatment than those in older children. Those placed initially in second molars in eleven and twelve-year-olds required more resealants than those placed in older children. It was concluded that sealants had been a successful preventive procedure, but the failures of early placement leave some doubt as to the best time to place sealants.

#### **Sealants; Prevention; Effectiveness**

**Everdingen, Ton van; Eijkman, Michiel A.J.; Hoogstraten, Johan: Parents and nursing bottle caries. J Dent Child, 63:271-274, July-August 1996.**

In this study, the role of the parent in the phenomenon of nursing bottle caries is investigated. The main goal is to try to assess whether differences exist between parents and their children who suffer from nursing bottle caries and

parents and children who are not affected by this form of dental decay. To this purpose, a questionnaire was constructed. Results showed that, in contrast to parents of non-carries children, more parents of carries children give a bottle straight from birth. These bottles more often contain sugared drinks and are given during daytime as well as at night. Children with carries and non-carries children differ in two respects: carries children on the whole are older and they have been sick more often than non-carries children. Finally, habit seems to be the major factor contributing to the use of a bottle to a relatively high age. Discussion focuses on the characterization of "typical" carries parents and their children and the implication for educational programs such a characterization could have.

#### **Nursing bottle caries; Parental behavior**

**Jessee, Stephen A. and Rieger, Monty: A study of age-related variables among physically abused children. J Dent Child, 63:275-280, July-August 1996.**

One of every five substantiated cases of child abuse and over 50 percent of child-abuse-related deaths are the result of physical injury. The charts of 266 children, newborn to seventeen years of age, seen at Texas Children's Hospital during a two-year period were reviewed. Each child was assigned to one of four age-groups. Approximately 90 percent of all cases involved children five years old or younger, with 60 percent being less than two years of age. The results suggest that age is an important factor in the location, type, and severity of injuries due to the physical abuse of a child.

#### **Physical abuse; Age-related variables**

**Harn, Stanton D. and Dunning, David G.: Using a children's dental health carnival as a primary vehicle to educate children about oral health. J Dent Child, 63:281-284, July-August 1996.**

This study presents survey results regarding the utilization of a dental carnival as a primary educator of oral health in children. Three-hundred randomly selected parents/guardians (54.7 percent of the sample) returned useable surveys. Most carnival events/booths/characters received high ratings in both educational and entertainment value. The entertainment value of events/booths was en-

hanced by the level of physical activity involved. A significant reduction in the fear children have in going to the dentist was attributed by respondents to attending the carnival. Respondents indicated that the toothbrushing, flossing and nutrition habits of children were enhanced by the carnival experience. The dental carnival is also seen as being an integral member of the dental team, along with the family and dentist/hygienist, in educating children about dental health.

#### **Oral health education; Carnival**

**Waldman, H.B.: Mid-1990s profile of U.S. children and the conditions in which they live. J Dent Child, 63:285-290, July-August 1996.**

A series of reports from the Bureau of the Census provides an overview of the changing demographic picture of the youngsters in our communities in the mid-1990s. An awareness of these developments is essential if the profession is to provide for the needs of our patients.

#### **Profile; Living conditions**

**Waldman, H.B.: Uninsured children and adults. J Dent Child, 63:291-294, July-August 1996.**

Almost 40 million U.S. residents do not have health insurance. A summary of various government and private agency reports is provided in an effort to increase a practitioner's awareness of the demographic distribution of the uninsured in our communities.

#### **Uninsured; Children; Adults**

**Waldman, H. Barry: Your next pediatric patient may not be getting needed child support payments. J Dent Child, 63:295-298, July-August 1996.**

The author reviews the personal problems faced by children in single-parent and divorced-parent households, emphasizing the altered economic realities accompanying the dissolution of a marriage or the birth of a child to an unwed mother.

#### **Economic realities; Single parent; Divorced parent**

**Rad, Ali Salehi and Reid, James: Delayed eruption of a permanent molar associated with a complex odontome: Report of case. J Dent Child, 63:299-301, July-August 1996.**

The difficulties and importance of making a correct diagnosis of a complex odontome are highlighted in this case report.



## For your information

Nominating committee report:

President-Elect—Dennis N. Ranalli

Vice-President—James T. Barenie

Secretary-Treasurer—Lawrence A. Dobrin

Trustee for three-year term—Dr. Laura Durham

Trustee for three-year term—Dr. Deborah Studen-Pavlovich

Respectfully submitted by Peter Fos, John Willis, Hala Henderson, Jimmy Pinkham, chairman

Voice Mail has been installed in the National Office for the convenience of callers who wish to leave messages for specific persons.

With the help of Dr. Mark Taylor of Omaha, an ASDC home page will soon appear on internet.

ASDC officers and others are planning to visit a Children's Hospital in New Orleans at the time of the annual meeting. It is planned to distribute toothbrushes and other oral hygiene materials at the visit.

An ad will appear soon in a South American dental journal inviting readers to apply for ASDC membership. The ad will also announce the introduction of two popular ASDC brochures, now available in the Spanish language.

The development of a new membership directory is underway. It is planned to make the directory an attractive and helpful tool for our members.

President Peter Fos recently distributed the initial draft of the ASDC Strategic Plan—1996–2000. The document was drafted from several reports from subcommittees. The completed plan will be developed from the initial draft and from comments by committee members, officers, trustees, and others who have been asked to study it. The plan is the brainchild of President Fos. A brief summary of the plan follows.

This plan has been conceived and developed at a time of great uncertainty and anticipation for professional dental organizations. The traditional roles and activities of professional dental organizations have been under pressure due to many changes in society: competition for the "organization dues dollar," perceived competition among professional dental organizations, continuous modifications in health care delivery schemes, differing perspectives on dental clinical care concerns, and the explosion of technologies in clinical care.

ASDC is uniquely positioned to surge ahead in this environment. ASDC is the only group of dental care professionals in organized dentistry that is comprised of dental professionals who care for and treat children and adolescents. ASDC's membership is made up of general dentists and dental specialists. This unique configuration of dental professionals focused on children's dental and overall health allows for an atmosphere that can address the above organizational pressures.

This plan is organized in several ASDC functional areas: (1) membership, (2) budget and finance, (3) awards and recognition, (4) child care, child protection, and advocacy, (5) dental education, (6) publications, (7) public relations and publicity, (8) professional relations, (9) meetings, and

(10) organizational structure. Membership is the "life-blood" of ASDC. Membership concerns transcend, and interact with all functional areas. Recruiting and retaining members is of paramount concern to the organization. Activities must be re-emphasized, implemented, and developed to attract new members, as well as encourage continuation of membership. The Strategic Plan highlights these activities for future recruitment and retention of members.

Financial health and stability are essential for progress toward organizational goals and objectives. Financial considerations are directly linked to membership and prudent budgetary control. Several financial budgetary strategies are outlined in the plan.

Acknowledgment of service and contributions to dentistry for children is an important function of ASDC. ASDC has a distinguished history of contribution to children and dentistry for children. As part of this history ASDC has recognized its own, as well as that of others in advancing children's health. ASDC must continue to recognize outstanding achievements.

A major emphasis of the mission of ASDC is to advance the dental health of children. In practice, ASDC has expanded this emphasis to the overall health and well-being of children. Child care, child protection, and child advocacy are important in achieving this mission. The Strategic Plan continues this emphasis.

A cornerstone of the mission of ASDC is the dissemination of knowledge to dental professionals and the public. Dental education activities have been an integral part of ASDC in the past. Dental education efforts have focused on meetings and publications. The Strategic Plan outlines dental education strategies for the next five years.

ASDC's outstanding publications, lead by the *Journal of Dentistry for Children*, have been recognized for many years as being of the highest quality. In association with public relations and publicity efforts, ASDC publications have strived to achieve broad based distribution of knowledge to all who have concerns for the health of children. These functional areas will continue to be essential in fulfilling the mission of ASDC.

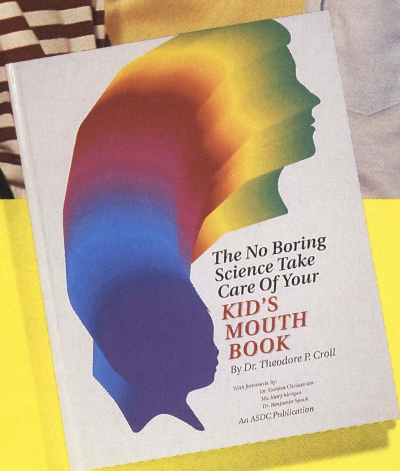
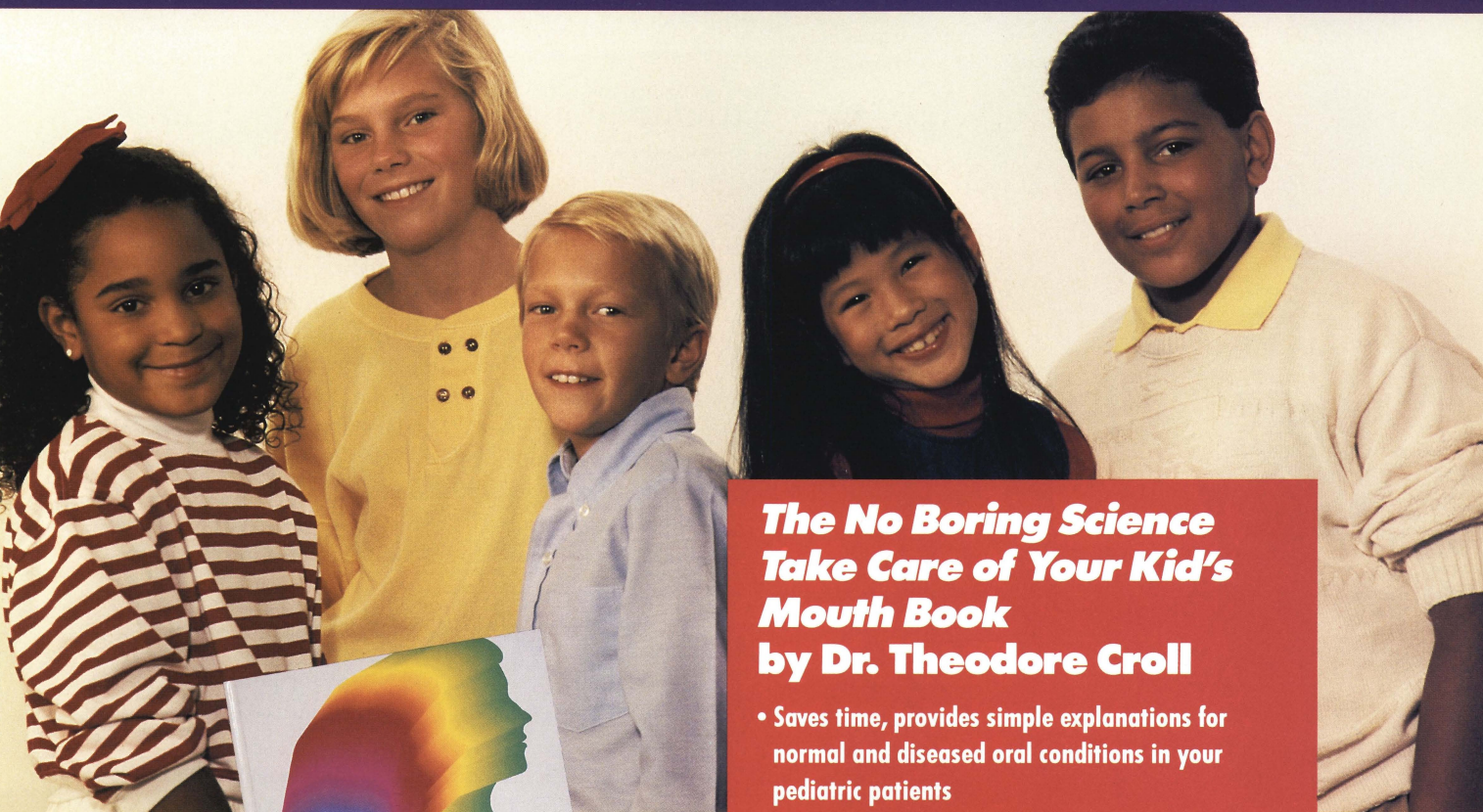
Dentistry, as a profession, is experiencing an era of fragmentation. Many professional organizations appear to be interested in working alone toward their goals and objectives. A perceived competition exists across organizations in areas of membership, publicity, meeting, organizational culture, organizational policy, and other aspects of organizational life. Developing strong relationships with other professional health care organizations should endeavor to work together toward their collective and individual goals and objectives.

Any planning document must not overlook a review and evaluation of the inner workings of the organization. The Strategic Plan presents an introspective evaluation of the organizational structure of ASDC. A properly configured and tuned organizational structure will allow for achievement of the many goals and objectives of ASDC.

Dr. Fos invites ASDC members to participate in the discussion of the Plan and to feel free to comment.

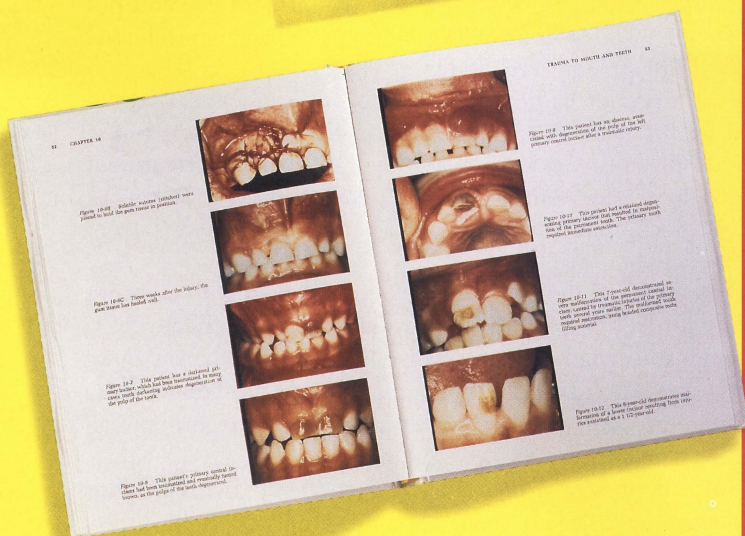


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Dr. Theodore Croll, the author, is a board-certified pediatric dentist with an intuitive ability to manage children.





## A tribute to Jorge M. Davila

A special friend of dental patients with mental and physical disabilities retired from the Eastman Dental Center in Rochester, New York, at the end of June. For twenty-nine years Dr. Davila was an integral part of the program at Eastman. He becomes professor emeritus and retires from the directorship of the program of dentistry for the disabled patient—the patient with developmental disabilities. He has helped to train many dentists in this important and demanding discipline. Dr. Davila directed many fruitful research studies that improved the care available to these special patients. With the support of federal grants, Dr. Davila has developed training materials on the management and treatment of people with disabilities. He has also developed audiovisuals to educate people with developmental disabilities and their caregivers about oral hygiene and how the dentist plays an important role in maintaining oral health. Many of these audiovisuals have been translated into Spanish for those dentists who have bilingual patients.

Dr. Davila helped produce a rich literature on the subject; several of his papers appeared in the *Journal of Dentistry for Children* through the years of his activity at Eastman. He focused on dental care and patient management for people with physical and mental disabilities. Much of his research led to procedures now considered standard treatment.

Dr. Davila earned his D.D.S. from the School of Dentistry in Cochabamba, Bolivia in 1953 where he practiced, researched, and taught for fourteen years. Dr. Davila came to Eastman Dental Center in 1967 and received his certificate in pediatric dentistry in 1970. He completed his master's degree at the University of Rochester in 1972.

Dr. Davila was co-appointed to a position as senior clinical and research associate at Eastman Dental Center and director of dental services at the Monroe Developmental Center in 1975. The Center's program at MDC evolved into a satellite clinic, providing oral health care services to people with developmental disabilities such as mental retardation, cerebral palsy, epilepsy, and autism. Dr. Davila also provided care for the developmentally disabled patients in the Center's general dentistry and pediatric clinics. In 1995 the Center gave up its satellite clinic at MDC and consolidated patient care for people with developmental disabilities at EDC.

The experiences of at least a few of us go back a sufficient number of years to build a special appreciation for the many contributions Jorge Davila has made to the care of those often-neglected persons. Aside from the lack of adequate treatment modalities and aids—effective local anesthetics, sedatives, general anesthetics, special instruments—the psychological components of these complex personalities were poorly understood and defined.

Psychologists in various categories of the specialty have provided us with a wealth of knowledge about people with handicaps. Vast improvements in the effectiveness and facility of use of anesthetics and sedatives have assured the adequate management of patient behavior in most cases. High-speed instrumentation and the newer filling materials have made it possible to deliver high quality dental care to virtually all patients with developmental disabilities.

Nevertheless, these patients still present special challenges to the dentist. The latter must recognize those challenges and see in them the opportunity to help a very special group of people. Professionals such as Jorge Davila accepted the challenges and in doing so made it possible for clinicians today to deliver quality care to these special patients.



## PRESIDENT'S MESSAGE

The "dog days of summer" are upon us, especially in the Deep South where I live. But the hot weather has not slowed down the activities of ASDC. The second ASDC Educational Seminar of this year will be presented in San Antonio on Saturday September 7th. As you may recall the first seminar, presented in May in Chicago, was a grand success. The San Antonio seminar will be presented in collaboration with the Texas Unit of ASDC. Texas has historically been a strong area of support for ASDC and children's health. In the past ten years, two ASDC presidents came from Texas, Bob James and James Bugg. In fact, both of these presidents are from San Antonio. Kevin Donly, with the assistance of Bob Henry, has planned a very exciting program. Again this seminar will be presented as a member service, with ASDC members paying an administrative fee of only \$10. The speakers include Ted Croll, Catherine Flaitz, Bob Henry, and Carolyn Wilson. Ted Croll will present "A clinical renaissance in children's dentistry" in the morning, while Catherine Flaitz, Bob Henry, and Carolyn Wilson will share the afternoon. Their topics will be (1) "bread and butter oral lesions in children," (2) "principles regarding the psychology and pharmacology of behavior management," and (3) "management of dental traumatic injuries in children." The La Mansion del Rio hotel will be the seminar site for those of you who plan to spend the night. I plan to be there, so I hope to see many of you at the seminar.

It is not too late to register for the ASDC Annual Meeting. New Orleans is the meeting site and an excellent meeting has been planned. In addition to the main scientific program, featuring C. Richard Bennett, Kevin Donly, and Leonard Carapezza, other presentations are planned. Breakfast with the Experts will again be a part of the program, featuring Martin Davis, Bill Posnick, Bob Musselman, Jimmy Pinkham, and John Nathan. In addition, Mini-clinic and table clinic presentations will be meeting highlights. Meeting dates are October 23-27, with the Westin Canal Place serving as our meeting hotel. I hope that you can attend.

Since my last message I had the opportunity to meet

with the Budget Committee and the ASDC accounting firm, represented by Mr. Jerry Lipinski. ASDC is presently in sound financial condition. As is the case in most professional organizations, our membership numbers are static, with little change during the past year. We need new members to allow us to continue existing programs and to implement new ones. The ASDC Budget Committee will present a balanced budget, of approximately \$700,000, to the House of Delegates at the Annual Meeting.

During the Budget Committee meeting Dr. Norman Olsen, ASDC Executive Director tendered his resignation, which I reluctantly received on behalf of ASDC. Norm has been serving as ASDC Executive Director since December of 1993, shortly after retiring as dean at Northwestern. Norm has had a series of health problems, beginning in December of 1995. To be precise, Norm has experienced two angioplasty operations since January, the most recent on June 20th. In addition, Norm has experienced two minor medical emergencies that resulted in hospital stays, the most recent during the last week of July. A person of Norm's stature, wisdom, and work ethic will be sorely missed and difficult to replace. But it is in Norm's best interest to slow down and take care of himself. Norm has volunteered his services in the future to assist ASDC. We will undoubtedly call on him as needed. Norm will be an honored guest at the 1996 Annual Meeting in New Orleans.

The ASDC Strategic Plan is nearing completion. The SWOT analysis has been translated into a "true" planning document. The ASDC Strategic Plan Steering Committee is now reviewing the plan for final edits. Ten past presidents and several members are also making insightful contributions. I would like to thank all of you who have participated in this project. I realize that planning exercises are less than enjoyable and I sincerely appreciate your assistance. The completed plan will be presented to the House of Delegates at the upcoming Annual Meeting. I hope that this plan will serve as a guidebook for the near future of ASDC.

Peter J. Fos



# EDITORIAL

## Prediction and control

Gaining the cooperation of the pediatric patient remains the most important challenge for the dental clinician. Clinical achievement and the future health status of the child are dependent on it. The use of sedation and general anesthesia to attain it should be the exception, however, not the rule. Improved local anesthetics, modern technologies, and the newer filling materials have reduced the time required to treat patients successfully; and a greatly expanded body of knowledge of child development makes it possible for us to cope more intelligently with children's behavioral challenges.

For example, would psychologists, twenty years ago, have seriously suggested that "Bad behavior is good for your child"? Dr. Peter Williamson says so in his book *Good kids, bad behavior. Helping children learn self-discipline*. (New York: Simon and Schuster, 1990, Chapter 2). The introductory paragraph states, "When your child misbehaves, she is carrying out one of the healthiest activities of childhood. It is the way in which children learn to regulate themselves and understand others. By misbehaving they are able to test the continuity of their boundaries. It is in the nature of children to oppose the limits their parents set, and look at how they do it! Set a rule before a child in clearest black and white, and it usually isn't too long before the child finds that barely visible band of gray and wedges herself firmly into it. How irritating to the parents, how important for the children."

Rather than to see this development in terms of good or bad, we should admire the intelligence and creativity involved in the child's solution to her problem. Williamson suggests that we attempt to recognize the child's ingenuity, rather than to judge her response on some moral scale.

Temper tantrums and power struggles are not uncommon in dental offices. They are often viewed by embarrassed parents as rebellion against established order and as a foreshadowing of worse things to come in adolescence, even though currently the child may be only three years old. In order to accept misbehavior as a learning opportunity, we must first understand what misbehavior is about.

Williamson (*ibid* p 28) recommends that we "Consider the function of misbehavior from the child's point

of view. Misbehavior is the primary mode through which children learn self-control and the ability to predict how other people will respond to them. As parents, we worry about such things as developing morality and other qualities of good citizenship. But to young children, these concepts are hopelessly abstract; indeed, even if they could conceive of such ideas, they would not be the least bit interested in them. What they are concerned with is regulating their own behavior and mastering some basic social independent living skills. In the early part of this century the psychologist John B. Watson stated that 'the prediction and control of behavior are the two goals of psychology.' This is especially true of children. Prediction and control are, in fact, the two great organizing principles in the psychological development of the child. Misbehavior, then, is the means by which children can ask "What if...?" If we look at "bad behavior" this way, we can see that it is very *healthy* for our children. This is how they learn."

Adults realize the importance of prediction, the ability to plan ahead. They take it for granted, forgetting that children must still learn how society works.

The concept of control is equally important. Searching our own experience, we realize the importance of being in control of a situation. Again, to control a situation, we must understand it, and be able to predict the consequences of different courses of action. The process for children is much the same. At each stage of development, children learn to adjust to their environments; and as these adjustments are made, behavior also is subject to adjustment.

Williamson says that it is important for us to understand that children are always engaged in the business of predicting the world around them and regulating their behavior accordingly. "Though you may think," he says, "of your child as a little stinker, in actuality he or she is more like a little scientist. Children develop hypotheses, test them out, and evaluate their results." We can assume, therefore, that misbehavior is the medium for development of the child scientist. If we want to provide predictable and orderly answers, we must apply predictable and consistent discipline as a means to that end.



## CLINIC

# Effects of carbamide peroxide whitening agents on enamel surfaces and caries-like lesion formation: An SEM and polarized light microscopic in vitro study

Catherine M. Flaitz, DDS, MS

M. John Hicks, DDS, MS, PhD, MD

Although tooth whitening has only recently become commonplace in dental practices, attempts at removing esthetically displeasing stains with direct application of oxalic acid, various forms of chlorine, and hydrogen peroxide occurred during the late 1800s.<sup>1</sup> By the early 1900s, the efficacy and benefits of hydrogen peroxide in whitening discolored enamel was established.<sup>1,2</sup> Hydrogen peroxide oxidizes organic molecules in a nonspecific manner by generation of electrophilic, unstable free radicals with unpaired electrons (superoxyl and peroxy ions).<sup>3-5</sup> The whitening effect is due to degradation of high molecular weight, complex organic molecules that reflect a specific wavelength of light and are responsible for the color of the stain. The resulting degradation products are of lower molecular weights and are less complex molecules that reflect less light and result in a reduction or elimination of the discoloration. During the 1970s and 1980s, many dental practitioners whitened discolored vital and nonvital teeth, using high concentration hydrogen peroxide (35 percent) or sodium per-

borate in combination with either high intensity visible light or low heat. While these agents did provide a considerable whitening effect, there were certain disadvantages. The applications were relatively time-consuming for the dentist. Gingival and pulpal irritation and surface-structure alterations in hard tissues were relatively frequent.<sup>9-19</sup> With nonvital teeth, it was possible to induce external cervical root resorption by intracoronal hydrogen peroxide bleaching.<sup>20</sup>

During the late 1980s, several practitioners fortuitously noted that a carbamide peroxide antiseptic (GlyOxide, Marion Merrill Dow, Cincinnati OH 45215), used for treatment of soft tissue injury, aphthous ulcers and as a generalized oral cleansing agent after oral or periodontal surgery, resulted in significant whitening of tooth enamel, especially when delivered in a custom-fitted tray.<sup>21,22</sup> Further clinical studies proved that the application of carbamide peroxide could lessen or eliminate enamel discolorations.<sup>23-25</sup> Since that time, carbamide peroxide in a viscous gel (carboxymethylene polymer), which allows for prolonged contact and slow release of free radicals, has been adapted for dentist-prescribed/home-applied vital tooth whitening. Use of a custom-fitted tray as a carrier for the carbamide peroxide agent for prolonged periods during the day or at night has become the standard method of tooth whitening recommended by many practitioners.

Because carbamide peroxide agents are utilized over prolonged periods and a certain amount of enamel matrix may be degraded, we undertook an in vitro labora-

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The authors would like to express their appreciation to Mr. J.P. Barrish for his expert technical skills in printing the SEM figures.



tory study to determine the effects of whitening agents containing carbamide peroxide on enamel surface morphology, using scanning electron microscopy, and on caries-like lesion formation in enamel, using polarized light microscopy.

## METHODS AND MATERIALS

Ten human molar teeth were examined macroscopically at 16x with a binocular dissecting microscope, to ensure that the enamel surfaces were caries-free. The teeth were sectioned into quarters and assigned to one of four treatment groups:

- ☐ *Distobuccal*: 10 percent carbamide peroxide gel (10 percent NW) treatment (Nite White, Discus Dental Inc., Beverly Hills CA 90210).
- ☐ *Distolingual*: 10 percent carbamide peroxide paste (10 percent PL) treatment (Platinum, Colgate-Palmolive Co., Piscataway, NJ 08854).
- ☐ *Mesiobuccal*: 16 percent carbamide peroxide (16 percent NW) treatment (Nite White, Discus Dental Inc., Beverly Hills, CA 90210).
- ☐ *Mesiolingual*: control, with no treatment.

The whitening agents were applied as recommended by the manufacturers for optimal whitening effect. Following completion of the whitening treatment, each tooth quarter was divided into two portions. One portion of each tooth quarter was prepared for evaluation of the treatment effect on enamel surface morphology using standard scanning electron microscopic (SEM) techniques (JEOL JSM6100, JEOL USA Inc., Peabody, MA 01960). The remaining portion of each tooth quarter was coated with an acid-resistant varnish except for the treated enamel surface. Caries-like lesions in enamel were created using a dialyzed acidified gel (pH  $4.25 \pm 0.02$ ) without addition of exogenous calcium, phosphate or fluoride. Following a six-week acidified gel exposure period, longitudinal sections were taken from each tooth quarter and examined while immersed in water, using polarized light microscopic techniques. Mean body of the lesion depths were determined by projecting photomicrographs of the lesions onto a digitized tablet and taking five separate measurements along the advancing front of each lesion. The lesion depths were compared among the treatment groups (ANOVA, Duncan's multiple range test for paired samples). This research design allowed for direct comparison among treatment groups within each specimen and reduced tooth-to-tooth variability.

## RESULTS

The surface morphology of enamel following exposure to the whitening agents was considerably altered when compared with untreated sound enamel. The untreated surfaces showed the typical perikymata and imbrication lines characterized by an undulating or "hill and valley" appearance on SEM examination (Figure 1). These surfaces were relatively smooth, with only occasional termination of enamel prisms at the surface. In contrast, the carbamide peroxide gels (10 percent and 16 percent NW) possessed irregular surfaces with considerable porosity, exposure of the underlying prism structure of enamel, and preferential loss of prism cores (Figures 2 and 3). The 10 percent NW gel treatment resulted in enamel surfaces with frequent loss of prism cores (Figure 2). The adjacent enamel had an amorphous character, and it appeared as though the mineral mobilized from the prism cores was deposited on the adjacent enamel surface, masking the characteristic perikymata and imbrication line structures typically present with sound enamel. Following 16 percent NW gel exposure, the surface porosity increased further with prominent loss of prism cores and retention of the prism peripheries (Figure 3). Some of the prism cores had a hollow appearance, whereas others had variably sized porosities, and still others were occluded by precipitation products. Cratering of the enamel surface was not identified. In contrast, the 10 percent PL paste treatment resulted in enamel surfaces with an amorphous surface layer ob-



Figure 1. Surface morphology of sound enamel from untreated control group (original magnification 3,000X).



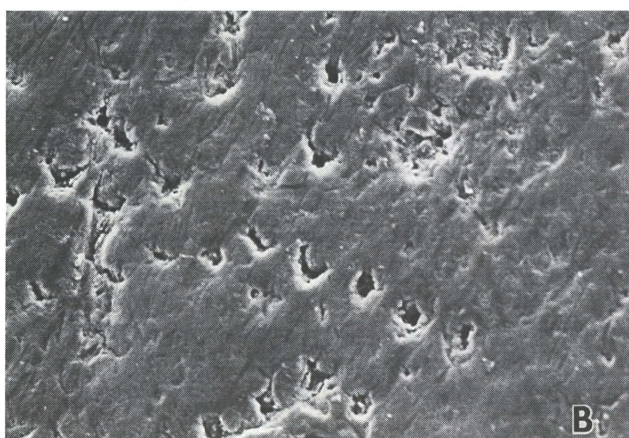
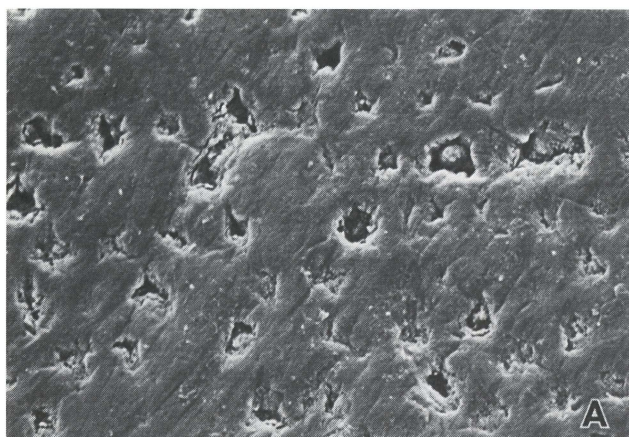


Figure 2. Effect of 10 percent carbamide peroxide gel (10 percent Nite White) on sound enamel surface morphology (A, original magnification 3,200 $\times$ ; B, original magnification 3,600 $\times$ ).



Figure 3. Effect of 16 percent carbamide peroxide gel (16 percent Nite White) on sound enamel surface morphology (A, original magnification 1,500 $\times$ ; B, original magnification 2,800 $\times$ ).

scuring the characteristic perikymata and imbrication lines of surface enamel (Figure 4). The surface coating was quite dense and enamel prism terminations were not appreciated. Loss of the prism cores and exaggeration of prism peripheries, as seen with the 10 percent and 16 percent NW gels, were conspicuously absent. Although there was considerable alteration of the enamel surface, following carbamide peroxide gel or paste treatment, all enamel surfaces were considered to be intact.

Caries-like lesions, formed in enamel, were quite different among the treatment and control groups (Table, Figure 5). The depth of the body of the lesion was increased with the carbamide peroxide gels (10 percent and 16 percent NW) when compared with paired control lesions. The 16 percent carbamide peroxide gel treatment group had lesion depths 18 percent greater than those for the control group ( $p < 0.05$ ); while a 6 percent

increase in lesion depth occurred with 10 percent carbamide peroxide gel treatment ( $p < 0.05$ ). In marked contrast, the 10 percent carbamide peroxide paste (10 percent PL) showed a reduction in lesion depth of 10 percent, when compared with paired controls ( $p < 0.05$ ). The greatest difference in lesion depth was between the 16 percent carbamide peroxide gel (16 percent NW) and the 10 percent carbamide peroxide paste (10 percent PL) with lesion depth being 31 percent less for 10 percent PL ( $p < 0.05$ ). An 11 percent lesion depth reduction was present with 10 percent PL, when compared with the 10 percent NW group ( $p < 0.05$ ). Surface-zone depth was greatest with 10 percent PL and least for the 16 percent NW gel ( $p < 0.05$ ). Significant increases in surface-zone depth were present with the 10 percent PL group, when compared with either NW gel group ( $p < 0.05$ ). The 16 percent NW group ( $p < 0.05$ ) had a



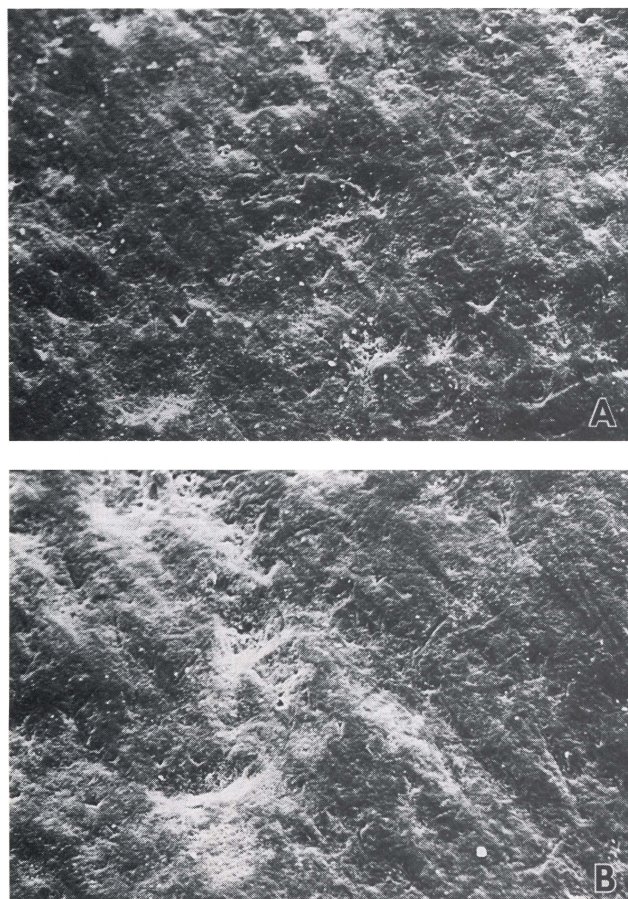


Figure 4. Effect of 10 percent carbamide peroxide paste (10 percent Colgate Platinum) on sound enamel surface morphology (A, original magnification 2,400 $\times$ ; B, original magnification 3,000 $\times$ ).

significant decrease in surface-zone depth, when compared with the controls and there was a considerable decrease in the surface-zone depth in the 10 percent NW group ( $p > 0.05$ ) as well.

The histopathologic features of the caries-like lesions differed among the treatment groups (Figure 5). Enamel surfaces overlying caries-like lesions from the 10 percent NW and 16 percent NW treatment groups were more irregular than those for either the control or 10 percent PL group. Surface zones in the 10 percent PL group had a qualitatively higher degree of negative birefringence (pore volume  $< 5$  percent) when compared with the 10 percent NW, 16 percent NW, and control groups. Surface zones within the 10 percent NW and 16 percent NW groups tended to show focal areas of pseudoisotropy (pore volume = 5 percent) and positive birefringence

Table 1 Carbamide peroxide whitening agent effect on caries-like lesion formation in enamel.

	Surface zone depth (Mean)	Lesion depth (Mean)	Lesion depth Comparison (%)	
Control group	33 $\mu\text{m}^a$	135 $\mu\text{m}^d$	18	10
16% Carbamide peroxide gel (16% Nite White)	24 $\mu\text{m}^{a,b}$	159 $\mu\text{m}^{d,e}$	6	10
10% Carbamide peroxide gel (10% Nite White)	29 $\mu\text{m}^c$	144 $\mu\text{m}^f$	11	31
10% Carbamide peroxide paste (10% Colgate Platinum)	39 $\mu\text{m}^{b,c}$	121 $\mu\text{m}^{e,f}$		

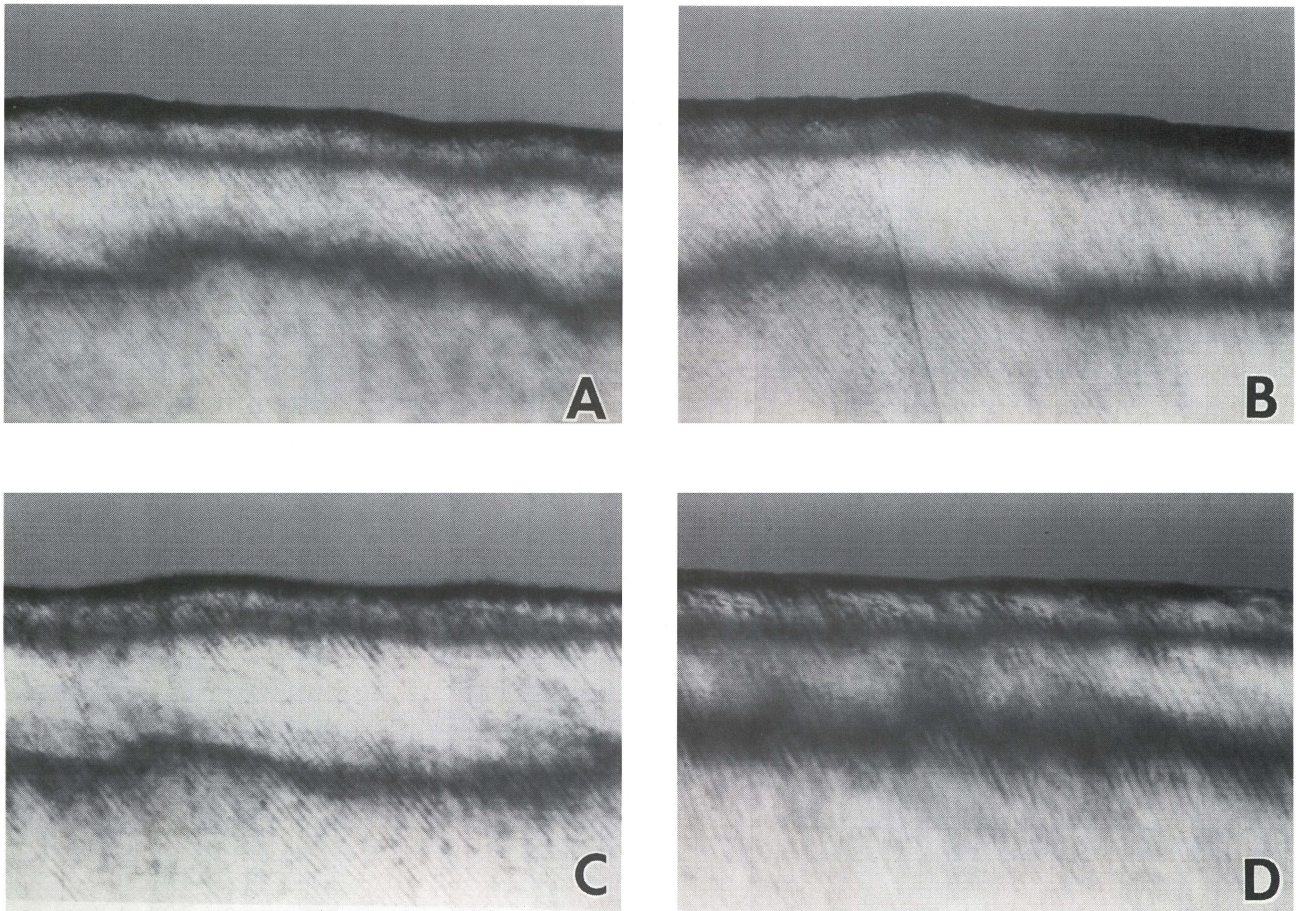
Means with same letter are significantly different ( $p < 0.05$  ANOVA, DMR for paired samples)

(pore volume  $> 5$  percent). The bodies of the lesion in all groups had relatively uniform advancing fronts. The qualitative degree of positive birefringence within the bodies of the lesions was considerably different among groups. The 10 percent NW and 16 percent NW treatment groups possessed bodies of the lesion with qualitatively increased positive birefringence, when compared with both the control group and in particular the 10 percent PL treatment group. There was also loss of distinction of prism markings and striae of Retzius within the bodies of the lesions in the 10 percent NW and 16 percent NW groups. The typical body of the lesion in the 10 percent PL group was characterized as having a significant proportion of its periphery composed of pseudoisotropic enamel (pore volume = 5 percent) with a central area of lessened positive birefringence (pore volume  $> 5$  percent), when compared with control, 10 percent NW and 16 percent NW groups. Prism markings and striae of Retzius were readily identified within the typical body of the lesion in the 10 percent PL group.

## DISCUSSION

During the 1990s, increasing numbers of dentists have recommended and prescribed home-applied tooth whiteners for their patients seeking to eliminate esthetically displeasing tooth discolorations. In a survey of general practitioners conducted in 1995, home-applied whitening agents were dispensed by 87 percent of dentists. In contrast, only 44 percent of dentists indicated that they performed chairside whitening procedures. Slightly over half (53 percent) of respondents indicated that they actively market this esthetic service within their practices.





*Figure 5. Caries-like lesion formation following carbamide peroxide whitening agent treatment. A) Nontreated control lesion; B) 16 percent carbamide peroxide gel (16 percent Nite White) lesion; C) 10 percent carbamide peroxide gel (10 percent Nite White) lesion; D) 10 percent carbamide peroxide paste (10 percent Colgate Platinum) lesion. (Representative paired lesions created in tooth quarters from same tooth. Water imbibition, Polarized light microscopy. Original magnification 200 $\times$ ).*

It has also been found that an increasing percentage (71 percent in 1995 vs 53 percent in 1991) of dentists reported patient sensitivity as a result of whitening agents. Most dentists who reported patient sensitivity relayed that less than a third of their patients experienced symptoms from the whitening agents and these symptoms were attributed by the dentist as overuse or improper use by the patients. The faith in these agents by the dental community is reflected by the fact that 36 percent of dentists and 68 percent of dental auxiliaries surveyed have used home-applied whitening agents on their own dentition.

Despite the beneficial effects of home-applied whitening agents in reducing or eliminating stains, the findings in the current study pose certain concerns with

carbamide peroxide gels. The alteration in surface morphology with the 10 percent and 16 percent carbamide peroxide gels (Nite White gels) are similar to those described by other investigators.<sup>27-29</sup> In general, the degradation of organic matrix by free radicals generated from the whitening agents may result in substantial loss of enamel proteins with concomitant loss of mineral crystals embedded within the enamel proteins.<sup>8</sup> In the present study, the degree and extent of prism core loss was increased with the higher concentration carbamide peroxide gel. With the lower concentration carbamide peroxide gel, similar effects were noted, but lessened in severity. In addition, there appeared to be deposition of an amorphous precipitate adjacent to areas where mineral had been lost from prism cores. These surface mor-



phology findings do not appear to be related to the resting pH (pH 6.9) of these carbamide gels. The effect of the 10 percent NW and 16 percent NW gels may be explained by the degradation process involved with generation of hydrogen peroxide free radicals.<sup>8</sup> Darkly pigmented organic material responsible for enamel discoloration is composed of carbon ring structures. This pigmented material is degraded by free radicals to less pigmented organic structures with unsaturated double carbon bonds. With further oxidation, these products are modified to hydrophilic nonpigmented carbon structures with saturated carbon bonds (the saturation point). Ideally, this is the point at which whitening should be terminated. If the degradation process continues, however, there is further decomposition of organic matrix, which can lead to complete oxidation with generation of carbon dioxide and water, resulting in total loss of enamel matrix protein. In marked contrast, the 10 percent carbamide peroxide whitening paste (PL) caused a homogenous, nonporous surface coating, with obliteration of the typical prism ends usually terminating at the enamel surface. This whitening paste is unique in that it contains a remineralizing agent, dicalcium phosphate dihydrate.<sup>23</sup> The presence of this remineralizing agent and the fact that this paste requires an increased length of time for whitening to occur may account for the morphological surface differences between this carbamide peroxide paste (PL) and the carbamide peroxide gels (NW).

The findings regarding surface morphology correlate well with bonding studies that have shown reduced bond strengths for carbamide peroxide treated enamel surfaces.<sup>27-35</sup> Reduction in bond strength may be on the order of 30 percent even three days following the last whitening treatment. If resin bonding is delayed by seven to fourteen days, however, bond strengths of composite resin to sound enamel and whitened enamel are similar.<sup>27,35</sup> This implies that the changes in the surface morphology due to the carbamide peroxide gels may undergo repair over time by precipitation of mineral phases derived from saliva into the surface porosities (remineralization). In addition, delaying bonding to whitened enamel may allow outward diffusion of residual peroxide through the enamel surface. Also, it has been shown that mechanical abrasion of whitened enamel before bonding will restore resin bond strength. The current recommendation is that application of an adhesive resin be delayed by seven to fourteen days, following whitening of an enamel surface. For this reason, it would be important to question patients, regarding use of home-applied whitening agents before the placement of an adhesive resin. Some patients may be using whitening agents prescribed by a

previous practitioner, or may be using an over-the-counter whitening agent. A number of whitening agent programs include a "touch-up" treatment on a monthly basis as well. This patient inquiry may prevent premature loss of adhesive resins in certain cases.

Perhaps the most interesting portion of this particular study was the effect of carbamide peroxide agents on the formation of caries-like lesions in enamel. While the carbamide peroxide gels (Nite White) showed considerable increases in the depths of the lesions and reduction in surface-zone depths, the carbamide peroxide gel containing the remineralizing agent (Colgate-Platinum) had a significantly decreased body of the lesion depth when compared with the control and 16 percent NW gel groups.<sup>23</sup> Furthermore, surface zones in this same group were also substantially increased in depth, when compared with the control and carbamide peroxide gel (Nite White) groups. In addition, the qualitative polarized light appearances of the typical body of the lesion and surface zone in the carbamide paste (PL) group were indicative of a decreased pore volume, suggesting a lessened degree of demineralization. The typical body of the lesion had a significant proportion of its area composed of pseudoisotropic enamel (pore volume = 5 percent) with the more central area exhibiting a lessened degree of positive birefringence when compared with the carbamide peroxide gel groups (NW). The carbamide peroxide gels (10 percent NW and 16 percent NW) possessed surface zones with focal areas of positive birefringence (> 5 percent pore volume) and pseudoisotropy, indicative of increased demineralization.

Although there were considerable differences in the surface porosity between the carbamide peroxide gels and paste groups in this study, a previous laboratory investigation has shown no change in surface enamel thickness.<sup>36</sup> Comparison of acid-etching alone, acid-etching before exposure to 30 percent hydrogen peroxide and microabrasion (18 percent hydrochloric acid followed by a pumice slurry) provided data that support a minimal loss of surface enamel. Acid-etching of enamel resulted in a loss of 5.7  $\mu\text{m}$ ; while acid-etching followed by 30 percent hydrogen peroxide produced a 5.3  $\mu\text{m}$  loss of surface enamel. In marked contrast, microabrasion of enamel with hydrochloric acid and a pumice slurry resulted in a 360  $\mu\text{m}$  loss of surface enamel. Other studies in which enamel loss, using the microabrasion technique, was evaluated have shown that between 14 to 26  $\mu\text{m}$  of surface enamel may be removed during each application.<sup>37,38</sup> This loss is quite significant considering that multiple applications are usually required for optimal removal of enamel stain. Use of a carbamide per-



oxide whitening agent would appear to create some surface porosities while degrading the organic materials responsible for the enamel discoloration, but not result in loss of surface enamel.<sup>8</sup> Loss of surface enamel would only occur if degradation were allowed to proceed past the saturation point and result in disruption of the enamel matrix proteins, with subsequent loss of the embedded mineral.<sup>8</sup> This emphasizes that at-home whitening agents require the supervision of a dentist to assure proper application, proper amount of gel/paste, length of treatment, and steps to avoid adverse reactions, such as fluoride rinses for tooth sensitivity. Periodic evaluations during the whitening treatment are necessary to avoid "over" whitening and possible deleterious effects to hard structures. In addition, periodic assessment by the prescribing dentist is recommended to determine whether "touch-up" therapy is needed, instead of usage on an *ad lib* basis by the patient.

Certain clinical implications may be drawn from this *in vitro* laboratory investigation. The effectiveness of home-application carbamide peroxide gels and pastes, using custom-fitted trays in reducing or eliminating unesthetic enamel stains has been established clinically in recent years and has become well-accepted in dental practices. The addition of fluoride rinsing after each whitening treatment may be beneficial in reducing the porosities created during the carbamide peroxide therapy and enhancing resistance to dental caries of the affected enamel. Use of a neutral sodium fluoride (0.02 percent) would replenish the fluoride which is most likely lost during the whitening session, and may hasten remineralization of the porous enamel surface. In addition, fluoride rinse following each treatment may also reduce the incidence of tooth sensitivity that occurs frequently. As illustrated in the present study, incorporation of a remineralizing agent within a tooth whitening system may reduce surface porosity and provide a caries-preventive benefit.<sup>23</sup> With the combination of remineralizing agents and fluoride rinsing, following whitening of stained teeth, the caries susceptibility, surface porosity, and tooth sensitivity may be reduced.

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### NO NEEDLES NEEDED

Because nobody likes shots, regardless of which end of the syringe they're on, scientists have been working on needle-free transdermal drug delivery since the 1980s. Although skin patches can effectively deliver a few substances, large, water-soluble molecules are a problem because the outermost layer of skin, a tough plate of dead cells surrounded by lipid bilayers, is designed to keep them out. Researchers at the Massachusetts Institute of Technology, however, have found a way to use ultra low-frequency ultrasound waves to jiggle the air pockets in these layers, creating pores that offer low-resistance pathways into the body. In the August 11, 1995, issue of *Science* they describe using this painless process to insinuate insulin, interferon, and other large molecules into live rodents and human cadavers. Although more studies are needed to make sure that introducing drugs in this way doesn't provoke some unforeseen immune problem, the researchers hope to begin testing the technique in patients this year.

Harvard Health Letter, vol 21, March 1996:  
Top ten medical advances of 1995.

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# Risk factors associated with acute dental pain in children

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**T**he understanding of the pain response in children is limited because of the multifactorial complexity of pain perception by children and its assessment by adults. There is a common misconception among clinicians that children do not experience pain with the same intensity and/or duration as adults.<sup>1</sup> Schechter and coworkers compared hospital analgesic usage between child and adult patients with the same medical diagnoses.<sup>2</sup> They reported that children received narcotics at a 50 percent frequency rate to that of adults. In other medical studies, it was recognized that children do experience moderate to severe pain following surgical procedures, but an analysis of the prescribed analgesics revealed that doses were often too small and/or too infrequent to alleviate the pain adequately.<sup>3,4</sup> The problem of acute pain management in children centers on the difficulty of assessing their pain objectively because of their limited ability to understand instructions regarding assessment of their pain, and to articulate descriptions of their pain.<sup>1</sup>

It was documented that some pediatric patients require analgesics to alleviate postoperative pain following routine dental procedures.<sup>5-8</sup> The prevalence of reported pain following routine dental care seems to vary with the

type of procedure performed.<sup>9,10</sup> Those children receiving dental extractions reported the highest prevalence of postoperative pain.<sup>6,7</sup> The purpose of this study was to identify risk factors derived from a child's clinical and radiographic examinations that would help to predict subsequent postoperative pain, following primary-tooth extractions.

## METHODS

The subjects consisted of sixty-two healthy children, ages two to ten years, requiring one or more extractions of primary teeth. All patients were treated in the University of Florida Pediatric Dental Clinic for planned procedures or emergency care. The study design was approved by the University of Florida Institutional Review Board and an informed consent was obtained from the parents. Those patients without home telephone and without parental supervision for seven hours postoperatively were excluded from the study. Those patients taking analgesics within four hours before the dental extraction were also excluded from the study.

All patients were subjected to a thorough history, and clinical and radiographic examinations. The history included, among the routine health history questions, inquiry as to the history of preexisting dental pain within the past forty-eight hours. The examination included careful assessment of the clinical findings and a mandatory periapical radiograph of the involved tooth. Dur-

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Table 1 □ Prevalence of reported pain based upon patient age.

	Prevalence of reported pain							
	Preexisting pain (within 48 hrs)				Postextraction pain (within 7 hrs)			
	# of Subjects	Age (months)	Standard error	Significance *	# of Subjects	Age (months)	Standard error	Significance*
No pain reported	21	78.6	± 4.5	p = 0.540	41	75.4	± 4.0	p = 0.057
Pain reported	41	83.1	± 5.4		21	89.3	± 6.2	

\*ANOVA

ing this examination, the following information was recorded: chronologic age (in months), sex, race, number of extractions required (1 or > 1), dental arch (maxillary or mandibular), tooth position (anterior - incisor/canine or posterior - molar), degree of tooth mobility (< 1 or > 1 mm), existing root length (< 1/3, 1/3-2/3, > 2/3) estimated from the periapical radiograph, presence of radiographic osseous resorptive defects, and presence of soft tissue inflammation adjacent to the involved tooth.

All children were given 2 percent lidocaine with 1:100,000 epinephrine injection for local anesthesia sufficient enough to obtain adequate anesthesia, but not exceeding 4.4 mg/kg. All primary teeth were extracted intact with a minimum of surgical trauma. Following the dental extraction, the parent was given an appropriate amount of Children's Tylenol® (McNeil Labs, Fort Washington, PA) chewable tablets with instructions to administer them to the child only if postoperative pain occurred. A pamphlet containing written home-care instructions was also provided to the parents.

The parents were instructed to be alert for pain-related behaviors (crying, agitation, withdrawal) that were unique for their child and to note any oral complaint of pain by the child for a seven-hour period following the extraction. The parents agreed to be reached by telephone the following morning. All parents were called by the same investigator on the morning following the dental extractions, to collect the required information. The telephone conversation followed a standardized format in that the parent was first asked whether the child experienced pain. The vast majority of parents answered without hesitation and appeared comfortable with their assessments. The parents were asked to explain the bases of their assessments (observed behavior, self-report, or both). In those rare cases where further clarification was necessary, additional inquiry was made to validate the response until both parties were satisfied. No attempt was made to rank the pain in accordance with its severity.

## RESULTS

The mean chronologic age of the sixty-two subjects studied was eighty months. The prevalence of reported pain based upon the patient's chronologic age is found in Table 1. Forty-one (66.1 percent) of the subjects were reported by their parents to have preexisting dental pain within the previous forty-eight hours. The mean age of this group was slightly older (eighty-three months), but not statistically different from the group reporting the absence of preexisting pain. Twenty-one (33.9 percent) of the subjects were reported by their parents to have postextraction pain within seven hours following the procedure. The mean age of this group was also older (eighty-nine months); this difference, however, approached statistical significance ( $p = 0.057$ ) using ANOVA. The results of this analysis indicated that postextraction pain was more likely to be reported by parents in an older subset of the study population.

Table 2 represents the prevalence of both preexisting and postextraction pain reported, as based upon the patient/tooth type characteristics of sex, race, number of extractions, dental arch, and tooth position. There was a nonsignificant trend for females and posterior teeth (primary molars) to be associated with preexisting pain. None of the variables analyzed in Table 2, however, were predictive for reporting postextraction pain.

Table 3 represents the prevalence of both preexisting and postextraction pain reported by parents, as based upon the clinical and radiographic findings of mobility, existing root length, the presence of osseous resorptive defects, soft tissue inflammation, and preexisting pain in their children. Subjects having preexisting pain tended to have osseous resorptive defects, but more significantly had involved teeth with greater existing root length and adjacent soft-tissue inflammation. None of the variables in Table 3, however, was predictive of postextraction pain. Of the forty-one subjects reporting preexisting pain, sixteen (39.2 percent) experienced postextraction pain. Of the twenty-one patients without preexisting



Table 2 □ Prevalence of reported pain based upon patient tooth type characteristics.

Variable	Criteria	Prevalence of reported pain						
		Subjects		Preexisting pain (within 48 hrs)			Postextraction pain (within 7 hrs)	
				Subjects	Significance*		Subjects	Significance*
		#	%	#			#	
Sex	Male	40	64.5	24	p = 0.169		13	32.5
	Female	22	35.5	17			8	36.4
Race	White	44	71.0	29	p = 0.954		16	36.4
	Black	18	29.0	12			5	27.8
Number of Extractions	1	43	69.4	30	p = 0.363		14	32.6
	> 1	19	30.6	11			7	36.8
Dental arch	Maxillary	43	69.4	27	p = 0.403		15	34.9
	Mandibular	19	30.6	14			6	31.9
Tooth position	Anterior	14	22.6	7	p = 0.147		4	28.6
	Posterior	48	77.4	34			17	35.4
Total		62	100.0	41			21	33.9

\*Chi Square Analysis

Table 3 □ Prevalence of reported pain based upon clinical radiographic findings.

Variable	Criteria	Prevalence of reported pain						
		Subjects		Preexisting pain (within 48 hrs)			Postextraction pain (within 7 hrs)	
				Subjects	Significance*		Subjects	Significance*
		#	%	#			#	
Mobility	< 1 mm	29	46.8	18	p = 0.527		8	27.6
	> 1 mm	33	53.2	23			13	39.4
Existing root length	< 1/3	8	12.9	2	p = 0.027		1	12.5
	1/3-2/3	22	35.5	15			6	27.3
	> 2/3	32	51.6	24			14	43.7
Osseous resorptive defects	Absent	20	32.3	9	p = 0.153		7	35.0
	Present	42	67.7	32			14	33.3
Soft-tissue inflammation	Absent	26	41.9	10	p = 0.0001		11	42.3
	Present	36	58.1	31			10	27.8
Preexisting pain	Absent	21	33.9	—	—		5	23.8
	Present	41	66.1	—			16	39.2

\*Chi Square Analysis

pain, five (23.8 percent) developed postextraction pain. Chi-square analysis revealed that these differences were not statistically significant ( $p=0.231$ ). The results indicated that there was no relationship between the presence of preexisting pain and the report of postextraction pain. Children presenting with preexisting dental pain are, therefore, not at risk for developing postextraction pain.

## DISCUSSION

Recent research into the parental report of postextraction pain in children has confirmed that children do experience pain severe enough to require analgesics.<sup>5-8</sup> The results of the present study of two to ten-year-old children, including only extractions of primary teeth, revealed a 33.9 percent prevalence of reported postextrac-

tion pain. This finding, taken from direct parental interview, was very similar to previously reported prevalence rates, ranging from 33 percent to 37.6 percent elicited from mailed questionnaires in a slightly older population (six to thirteen-year-olds) receiving extraction of both primary and permanent teeth.<sup>5,6</sup>

Previous investigations have suggested that the parental report of postextraction pain in children within the age-range of the present study increased with chronologic age.<sup>5,6</sup> The present study confirmed that finding for postextraction pain, but there was no chronologic age relationship associated with the report of preexisting pain. It is uncertain whether the correlation of a higher prevalence for parental report of postextraction pain with increasing chronologic age of their children is influenced by young children's limited ability to articulate pain and by parental bias that young children either ex-



perience less pain or tolerate it better. In the present study, preexisting pain report tended to be more frequent with females than males, but the difference was not significant. In other reports, female patients were significantly more likely to report pain after dental extractions and dental restorations.<sup>6,10</sup>

Similar to the numerous investigations on the influence of chronologic age and sex on reports of pain by adults, it is likely that studies with children will be equally as inconclusive and contradictory. It is interesting to speculate, however, that children may demonstrate more objective responses to pain, and with increasing age may become more subjective in their responses, with increasing expectations of pain based on life experiences. This speculation may partially account for the chronologic age differences reported in this and other studies previously reported.<sup>9</sup> It is also interesting to note that there existed no relationship between preexisting and postextraction pain reports among the present study population. Such a relationship might have been expected, but there are no reports in the literature for this age-group that would contradict or support the findings reported here.

Although none of the clinical and radiographic factors analyzed was significant in predicting postextraction pain, the completeness of the existing root length and the presence of adjacent soft tissue inflammation were statistically related to a report of preexisting pain. Acs and coworkers demonstrated that the degree of difficulty in extracting teeth as related to the extent of expected tissue damage determined from such factors as tooth type (primary vs permanent and anterior vs posterior) and root length were statistically significant in the report of postextraction pain among children.<sup>9</sup>

In children, pain assessment is difficult to measure, due to limited language skills, developmental factors, previous experiences, and parental attitudes toward a child's pain. Pain is very subjective, and can only be measured indirectly in children through oral self-reports

or observations of behaviors that suggest pain, such as vocalization, facial expression, and body movement. It is possible, therefore, to conclude that any pain assessment based upon oral self-report and parental observation of pain-related behaviors must be interpreted carefully and with caution. This limitation was discussed in greater detail in a study of preoperative analgesics, using a similar study population and design.<sup>8</sup> A greater sample size, with more pain assessment methods, may help to elucidate the contributory factors associated with the acute dental pain experience in children and further assist the clinician in determining the appropriate need for postextraction analgesics.

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#### SALIVARY MUTANS STREPTOCOCCI AND INCIDENCE OF CARIES

The initial age of the individual at which microbiological sampling occurs also may be an important factor when assessing dental caries risk [Masuda *et al.*, 1979; Grindejford *et al.*, 1991]. The results presented in this study suggest that children infected by age 3 with high levels of SMS have high levels of dental caries and are also at greater risk of developing decay than those children who do not harbor the bacteria. These results are consistent with other studies which show that the earlier a child is colonized with mutans streptococci, the greater is the likelihood of increased disease [Köhler *et al.*, 1988].

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# Bond strength of light-cured glass ionomers to carious primary dentin

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**G**lass ionomer materials have been used for years as liners, bases and temporary restorations for children. Their bonding properties allow temporization, which would be difficult with conventional cements or restorative materials. Pediatric dentists have used glass ionomer materials as interim restorations in primary teeth, because they are easier and faster to place than conventional restorations.<sup>1</sup> Glass ionomer materials have more desirable characteristics than conventional liners and bases.<sup>2</sup> The desirable properties include fluoride release, biocompatibility, and adhesion to dentin and enamel.<sup>3-6</sup> Various dentin pretreatments have been investigated in an attempt to increase the bond strengths of light-cured glass ionomer materials with varying results.<sup>7</sup> Rapid temporary treatment of early childhood caries or baby bottle tooth decay for preoperative or handicapped children may allow the child to mature and accept dental treatment later. This temporization might preclude the need for treatment using general anesthesia or sedation. The

decay progression pattern for young children is usually not pulpally invasive, but tends to progress laterally. This pattern leaves carious dentin lesions that are difficult to temporize with zinc oxide and eugenol or other temporary materials that rely on mechanical retention. Since complete decay removal is not always possible or desirable, temporization of decayed dentin surfaces can encourage caries arrestment. No previous studies have tested the ability of glass ionomer materials to bond with carious dentin. Finding the optimum glass ionomer system would enable temporaries to be placed on carious dentin with confidence.

The purpose of this study was to determine the effect of artificial dentin decay and a pretreatment with a polyacrylic acid solution on the shear bond strengths of two light-cured glass ionomer materials.

## METHODS AND MATERIALS

A 2 x 2 x 2 experimental design was used to test the effects of artificial dentin decay, a pretreatment with liquids containing PAA, and two different light-cured glass ionomer materials. The materials chosen were Vitre-bond<sup>®</sup> and VariGlass VLC.<sup>\*,\*\*</sup>

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<sup>\*\*</sup>The L.D. Caulk Co., Division of Dentsply International, Inc.; Milford, DE.



Freshly extracted human primary teeth were immediately placed in 7.5 pH phosphate buffered saline solution and glycerin (1:1) and stored at room temperature. The teeth were placed in distilled water for one week before being sectioned for use. The teeth were sectioned longitudinally and dentin surfaces were exposed by removing external enamel using a rough diamond bur with water coolant in a high speed hand-piece. The sectioned teeth were imbedded in self-curing acrylic resin blocks. The surfaces were sanded for ten seconds with 150 grit sandpaper on a rotating disk and then progressively polished with moist silicon carbide wet/dry finishing sandpaper in grits of 240, 320, 400 and 600 for five seconds each. Artificial caries-like lesions were created using the ten Cate system without fluoride.<sup>8</sup> The sectioned and polished specimens were placed in a single layer and covered with distilled water or the ten Cate solution for ninety-six hours at 37° C.

The specimen samples were randomly assigned to eight groups. The artificial decay specimens were scraped lightly with a fresh safety razor blade five times to simulate the clinical situation of spoon excavation of decay and to smooth any etched surface roughness created by the ten Cate solution. The PAA liquid-conditioned specimens were conditioned with a cotton pellet containing one drop of the liquid provided with each product for ten seconds and rinsed with water for fifteen seconds. An adhesive-backed paper, with one or two 1.7 mm round holes, was applied to each sectioned specimen on the flattened coronal dentin surface to serve as a template for the surface area of the materials to be tested. The glass ionomer materials were dispensed and hand spatulated according to the manufacturer's directions and approximately 3-mm cylinders were applied to the lightly dried dentin surfaces via delivery from within a plastic straw (Figure 1). The samples were subjected to a curing light† for forty seconds. The specimens with the glass ionomer cylinders attached were stored at room temperature in distilled water for twenty-four hours.

The shear bond strengths were tested by determining the force required to dislodge the material from the dentin using an Instron Universal Testing Machine.‡ The force was applied with a knife-edge loading head placed as close as possible and parallel to the specimens dentinal surface at a crosshead speed of 1.25 mm/min. The specimens were examined with a stereobinocular micro-

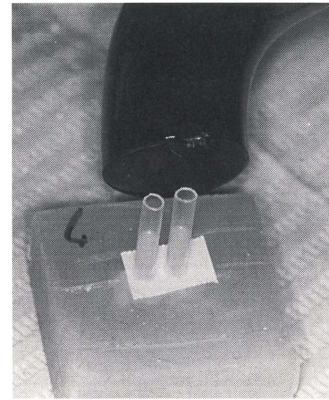


Figure 1. Curing the glass ionomer material on a mounted specimen.

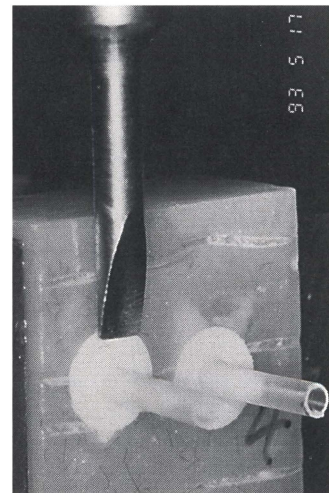


Figure 2. Mounted specimen ready for shear-bond-strength testing in Instron test machine.

scope (20x), to determine the site of fracture and to detect any voids inadvertently formed at the interface of the samples. The shear bond strengths were analyzed using the Student t-test.

## RESULTS

The bond strengths of glass ionomers to noncarious dentin were compared with bond strengths to carious dentin in Figure 3. There were no significant differences in bond strengths between the carious and noncarious dentin for either the PAA treated or non-PAA treated spec-

†The Max-model 0420-12, The L.D. Caulk Co., Division of Dentsply International, Inc., Milford, DE.

‡Instron Engineering Corp.; Canton, MA.



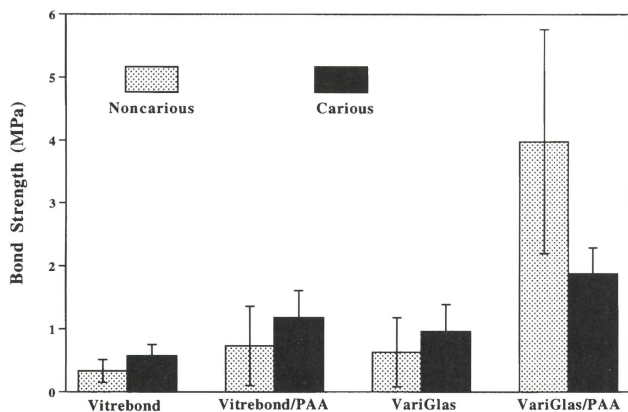


Figure 3. Shear bond strengths of glass ionomer materials to carious and noncarious dentin.

imens. An exception was the higher bond strength with VariGlas to noncarious dentin after pretreatment with the PAA containing liquid.

Comparison of Vitrebond groups with VariGlas revealed no significant differences between the two materials without pretreatment of the dentin. With PAA liquid pretreatment of both carious and noncarious dentin, however, significantly higher bond strengths were obtained with VariGlas. This difference is displayed in Figure 4, which compares Vitrebond and Variglass treatment groups. All of the conditions, with the exception of Vitrebond on noncarious dentin, had significantly greater shear bond strengths after pretreatment ( $p \leq 0.01$ ).

Observation under a 20x stereobinocular microscope revealed that the majority of the samples fractured at the dentin-glass ionomer interface. The exception was the group containing VariGlas on PAA pretreated noncarious dentin. Thirty percent of these VariGlas failures were cohesive.

## DISCUSSION

The reported shear bond strengths of VariGlas and Vitrebond on permanent dentin are significantly higher than those attained in this study using primary dentin.<sup>9-15</sup> Various studies demonstrate shear bond strengths for Vitrebond on permanent dentin from  $4.75 \pm 2.06$  MPa to  $8.06 \pm 1.14$  MPa, whereas the mean of  $0.33 \pm 0.18$  MPa obtained in this study on primary dentin is much lower.<sup>10,13</sup> No other studies examined glass ionomer bond strengths to primary teeth. Most of the previous shear bond studies were performed on permanent dentin pre-

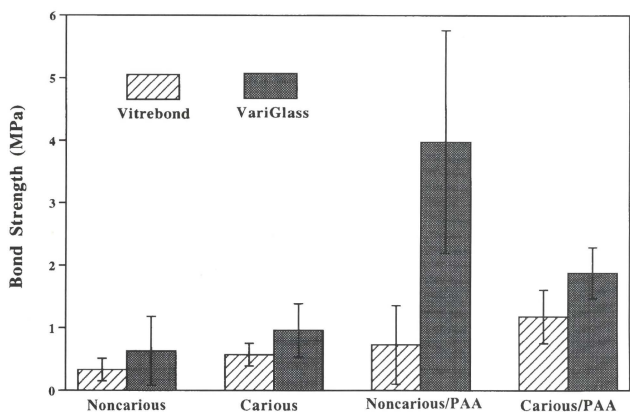


Figure 4. Shear bond strengths of Vitrebond and Variglass with and without polyacrylic acid (PAA) pretreatment.

pared to a 600 grit, which appeared to be the standard. The dentin examined in this study also was prepared to a 600 grit, to allow a comparison of shear bond strengths. The reason for this difference is unknown.

The mechanism of attachment of the glass ionomer materials to tooth structure is thought to be multifaceted, including chelation to the calcium ions in the hydroxyapatite, to form a calcium complex, micromechanical attachment to surface irregularities, and molecular diffusion into the dentin surface via surface wetting.<sup>6</sup> Since an exposed dentin surface is composed of collagen and hydroxyapatite, a glass ionomer material should be capable of bonding to both substrates. Many dentin bonding agents have similar ingredients to the liquid components of light-cured glass ionomers, including 2-hydroxyethyl methacrylate (HEMA) to promote surface wetting/penetration and PAA to modify or remove the smear layer. The PAA dissolves and decalcifies the hydroxyapatite surface layer in addition to being absorbed by it. Ruse and Smith found that dentin etching with phosphoric acid would remove the calcium and phosphorus from the surface to a depth of 1-2  $\mu\text{m}$ ; but the glass ionomer bonds remained the same or even increased without the ability for the chemical chelation reaction to occur.<sup>16</sup> Smith postulated that diffusion of the material into the etched dentin and penetration into the dentin tubules accounted for the calcific-deficient bond. The lack of significant differences in most of the artificial decay groups in this study would tend to support the view that attachment to the dentin collagenous matrix and fibrils, by means of diffusion/micromechanical attachment, is an adequate bond to retain these light-cured glass ionomer materials to a decayed surface as an



interim restoration. The reduction of microleakage is paramount to the actual magnitude of the bond strength, since the primary retention is from undercuts and irregularities in the remaining tooth structure.

The pretreatment of the specimens in this study with the liquids used to mix the glass ionomers, both containing PAA, was an attempt to increase the shear bond strengths. This was found to be significant in all situations of decayed dentin and VariGlass, but not for Vitrebond on nondecayed dentin, which had an insignificant increase in bond strength ( $p = 0.09$ ). These results contradict the Vitrebond instructions that state "the use of smear layer cleansers such as PAA based solutions results in decreased adhesion of the liner/base."<sup>17</sup> The other components included in the liquids besides PAA may also have had an effect on these findings.

The finding that the presence of artificial decay did not significantly affect the shear bond strengths to dentin with Vitrebond in any situation or VariGlass without a PAA pretreatment is encouraging. This would imply that the total removal of all decay is not mandatory to the adherence of these light-cured glass ionomer materials. The considerations given to incomplete removal of decay adversely affecting the bond strength are alleviated. In the case of extensive interim decay restoration, the speed of application could be increased with a clear conscience. Forsten has suggested that the initial high fluoride release from glass ionomer materials is bacteriostatic, if not bacteriocidal, and could arrest the activity of unintentionally left decay.<sup>2</sup> He also indicates the fluoride could assist in remineralization of uninfected inner dentin and demineralized enamel. Oral bacteria have shown growth inhibition zones from the fluoride ions in glass ionomer materials and a decrease in pH has been shown to increase the amount of fluoride released.<sup>3,18</sup> This may indicate an inhibition of secondary decay as a long-term benefit, since glass ionomer materials have been shown to release fluoride for more than two years.<sup>3,19</sup>

## CONCLUSIONS

The results suggest the following conclusions:

- ☐ Pretreatment with the PAA liquids increased shear bond strengths between the glass ionomer materials and both carious and noncarious primary dentin.

- ☐ Vitrebond bond strengths were generally higher, except in the case of VariGlass and a pretreatment.
- ☐ The study supports the use of light-cured glass ionomers for the interim restoration of decayed teeth for the pediatric patient.

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# Comparison of retentive qualities of two glass-ionomer cements used as fissure sealants

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When resin sealants are used, it is essential that they have an enduring quality, in order to gain full advantage of their preventive effects. Because of their fluoride-release, complete retention may be of less importance, however, when glass-ionomer materials are used as sealants.<sup>1-3</sup> This assumption is based on the observation of the remains of glass-ionomer cement, which were observed by scanning electron microscopy after a clinical loss of sealant had occurred; but it is unclear whether these remnants may still have a preventive effect.<sup>1,4,5</sup>

The results described in the literature concerning retention of glass ionomer cement sealants are somewhat conflicting. McLean and Wilson reported a retention rate of 84 percent after one year in selected fissures, with a fissure width of more than 100  $\mu\text{m}$ .<sup>6</sup> Comparable results were reported in studies where a glass ionomer cement restoration, whether or not in combination with phosphoric etching of the enamel, was used.<sup>7,8</sup> Although when a specially formulated glass ionomer cement sealant material was used, lower retention rates (varying from 1.7 percent to 45 percent after six months) were reported by several authors.<sup>1,9-11</sup> Due to the lower overall retention of glass ionomer cement sealants, compared to resin-based materials and the uncertainty of the long-

term caries preventive effect, glass ionomer cement sealants are reluctantly applied in daily dental practice.<sup>1,9,11-13</sup>

Nevertheless, there may be a need to protect occlusal surfaces before the molar is completely erupted. Then one is restricted in the use of resins, because complete isolation from saliva cannot always be obtained. In these cases glass ionomer cement can be an alternative and in view of rational practice management it is of interest whether 'special' glass ionomer cement sealant material is needed or whether a glass ionomer cement restorative material can be used instead.<sup>14</sup> Since the introduction of Fuji III® as a specially formulated sealant material, few developments regarding glass ionomer cement sealant materials have occurred. Nevertheless, new brands of restorative glass ionomer cement materials have frequently been marketed, of which the recently introduced Fuji Ionomer Type IX® is an example. Fuji IX is an improved version of Fuji II and was originally developed as the restorative material for the Atraumatic Restorative Treatment.<sup>15</sup>

The aim of this study is to compare, therefore, the retention rates of a glass ionomer cement designed as a sealant material with the glass ionomer cement restorative material.

## MATERIAL AND METHODS

In a clinical trial using a split mouth design, 104 children (mean age 10.4 years, s.d. 1.2), all patients of the Centre

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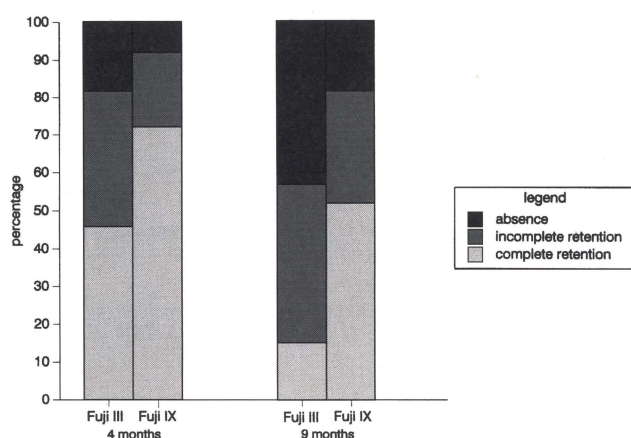


Figure. Retention percentages of Fuji III and Fuji IX.

of Youth Dental Health, Paramaribo (Surinam), received 104 Fuji Ionomer Type III® (G-C Corporation) and 104 Fuji Ionomer Type IX® (G-C Corporation) sealants. After cleaning with pumice, the materials were randomly placed in caries-free maxillary or mandibular first or second molars by five experienced dental auxiliaries. Moisture control was achieved by cotton rolls. Fuji IX was applied to the fissure with a ball burnisher and, to enhance adherence, finger pressure of a gloved finger with petrol jelly was used. Fuji III was applied with an Ash 49® instrument and covered with varnish according to the manufacturer's instructions. After initial hardening of the materials, the occlusion and articulation were checked by thin foil and, if necessary, corrected, using a round burr.

The sealants were evaluated 'blind' by calibrated dental auxiliaries other than those who applied the sealants. After four and again after nine months, the retention of the sealants was checked clinically (by visual inspection and in case of doubt a probe was used) and recorded as *complete retention*, *incomplete retention* or *absence of the material*.

As suggested by Riordan and FitzGerald, for split mouth designs besides retention percentages, also relative risks (RR) were estimated.<sup>16</sup> The 95 percent confidence intervals were determined, using a modified estimate of the standard deviation, since retention was classified in three categories instead of two as described by Riordan and FitzGerald. All other statistical analyses were performed by using SPSS/PC + V5.01.<sup>17</sup> Wilcoxon matched-pairs rank tests were used to calculate for the differences in success rates between pairs. The differ-

Table 1 □ RR Fuji III and Fuji IX after four months.

Retention	Fuji III	Fuji IX	Relative risk	(95% confidence-interval)
Complete	46	71		
Incomplete	35	20	.571	(.394-.829)
Absence	18	8	.444	(.247-.799)
	99	99		

Table 2 □ RR Fuji III and Fuji IX after nine months.

Retention	Fuji III	Fuji IX	Relative risk	(95% confidence-interval)
Complete	15	51		
Incomplete	41	30	.732	(.534-1.004)
Absence	43	18	.419	(.387-.453)
	99	99		

ences between female or male, maxillary or mandibular jaw, first or second molar, and operator effect were tested by means of a Chi-square test, for each material separately.

## RESULTS

During the period of the study, 99 patients with 198 treated molars were available for evaluation at four and nine months. Due to change of residence and illness five patients with ten sealants could not be assessed for both evaluation times.

Figure 1 shows the retention percentages after four and nine months. The difference in success rates of the two materials was significant on both evaluation occasions (Wilcoxon matched-pairs, signed-ranks test 2-tailed  $p < .001$ ). The relative risks for Fuji III and Fuji IX after four months and nine months are shown in Tables 1 and 2, respectively. Converted to chance to total absence, the chance for Fuji IX was about 60 percent less than that for Fuji III.

At the four-month recall as well as the nine-month recall no significant difference in retention per material was found between female or male, upper or lower jaw, first or second molar. Also no operator effect was noticed, according to the retention rates for the five operators.

After nine months caries was diagnosed in nine (5 percent) of the 198 originally caries-free molars. In all these molars (treated with either Fuji III or Fuji IX) the sealant showed incomplete retention or absence of the material after nine months, while in one of these molars the sealant was judged clinically to be absent after four months.



## DISCUSSION

The high rate of material loss for Fuji III in this study is confirmed in other studies.<sup>1,9,12,13</sup> After four months 46 percent of the Fuji III® and 72 percent of the Fuji IX® sealants showed complete retention with a further decline in retention to 15 percent and 52 percent, respectively, after nine months. Although not perfect, the retention rate of the restorative (Fuji IX) was significantly better than the sealant material (Fuji III). This better performance of the glass ionomer cement restorative material may be due to a higher strength, while the use of finger pressure can be advantageous in adherence and mechanical retention. The difference cannot be attributed to a difference in handling experience, since the dental auxiliaries were familiar with the handling of both glass ionomer cement materials. The percentage of retention of the restorative material was lower, however, than the results of Ketac Fil® as reported by McKenna and Grundy.<sup>7</sup> A reason for this difference could be the fact that the present study was carried out as a field study, whereas the operators in the study of McKenna and Grundy were student dental therapists working under training conditions.

Differences in retention rates are reported between operators and between mandibular and maxillary molars.<sup>1,7,10,12</sup> In our study, operator variability as a factor in retention of sealants was not noticeable. Also no favor in retention of the material for mandibular molars compared to maxillary molars was found.

The continuous fluoride release from the material may lead to a more mature and acid-attack resistant enamel at the fissures.<sup>2,18</sup> In the literature, caries preventive effects are reported to prevail even after visible loss of the glass ionomer cement sealant.<sup>1,3,5,14</sup> But in a recent study hardly any caries reduction was found with glass ionomer cement sealants after two years; while Shimokobe found inferior effectiveness in caries resistance for the glass ionomer cement-treated group compared to the resin-treated group after three years.<sup>11,19</sup> Thus it seems that there is still not enough knowledge of the caries-reducing effect of glass ionomer cement compared to resin-based materials. More long-term research, therefore, is needed.

## CONCLUSION

When glass ionomer cement is used as a sealant material, the results of this study showed the glass ionomer

cement restorative material to be more retentive than the glass ionomer cement sealant material.

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# The effectiveness of sealants in pediatric patients

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Cueto and Buonocore suggested the sealing of pits and fissures with an adhesive resin in 1967.<sup>1</sup> Since then the preventive use of pit and fissure sealants has been documented by many.<sup>2,3</sup> For example a six-year study of sealant effectiveness found 74 percent of the unsealed control group, compared to only 25 percent of the sealed teeth, had become decayed or were restored at the end of the study.<sup>13</sup> Simonsen reported the cost of treating unsealed teeth, compared to the cost of sealing and maintenance, was 1.64 times more to restore.<sup>11</sup>

Despite such evidence of cost effectiveness, in 1986-87 the National Health Survey, by the National Institute of Dental Research (NIDR), showed a disappointing use of occlusal sealants in children five to seventeen years of age.<sup>14</sup> Less than 8 percent of the children examined had first or second permanent molars sealed.

The purpose of this study was to review the history of (outcome) sealants in permanent molars placed in the University of Iowa's Pediatric Dentistry Clinic from 1985 to 1993.

## METHODS AND MATERIALS

Information from collegiate visit slips regarding procedures performed at the University of Iowa College of Dentistry is stored in the Collegiate Patient Manage-

ment System. All procedures performed are recorded by an ADA code. When an individual's permanent molar was identified by the computer as having been sealed, the following information was retrieved about the tooth and the patient:

- ☐ Tooth number.
- ☐ Initial date of placement.
- ☐ Birthdate, i.e. patient's age at time of placement.
- ☐ If any further treatment was performed on the tooth, the date of placement and procedure performed were noted.
- ☐ The last date the patient was seen in the clinic.

These data were collected for 7838 sealants that had been placed on permanent molars in the Pediatric Dental Clinic at the University of Iowa College of Dentistry.

## RESULTS

The histories of 7838 sealed permanent molars were reviewed (Table 1). The study shows that 6192 molars or 78.6 percent of the total did not require further intervention from the time of placement over the period of time that they were observed. This time varied from no record, because the patient had not returned to the clinic since the placement, to 7.92 years for first permanent molars and 7.88 years for second molars.

Of considerable interest should be the findings that, when comparing the replacement of sealants placed in first permanent molars of five, six, seven-year-old chil-

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Table 1 □ Teeth requiring no further treatment by tooth group.

Tooth group	Percentage requiring no treatment
All molars	6192 (78.6%)
Upper 1st molars	2191 (77.2%)
Upper 2nd molars	933 (79.4%)
Lower 1st molars	2178 (78.4%)
Lower 2nd molars	857 (81.9%)

Table 2 □ Comparing placement/replacement by age first permanent molar.

	Replacement	Not replacement	
Age			
5,6,7	576	1832	$X^2 = 60$
8 and older	290	1870	$P < .001$
	2nd permanent molar		
	Replacement	Not replaced	
11,12	177	644	$X^2 = 28.5$
13 and older	105	770	$p < .001$

dren with those placed in children eight years and above, a greater than the expected rate of failure occurred in the younger groups and less than expected occurred in the older children ( $p < .001$ ) (Table 2). Of the remaining molars that required further treatment, 1,040 or 13.2 percent of the teeth were resealed at some time; 513 teeth were treated with a preventive resin restoration or a class I composite; seventy-five teeth were treated with a one-surface amalgam; and fifty-seven teeth or less than 1 percent developed interproximal caries and required a two-surface restoration (Table 3). The average age at the time the sealant was placed was 10.55 years for teeth that required no subsequent treatment and 9.31 years for those requiring resealing (Table 4).

## DISCUSSION

Occlusal sealants as a prevention strategy have become for the treatment of pits and fissures in the permanent dentition what fluoride has been for the smooth surfaces of teeth. They have provided the means to prevent the impaction of food and the growth of bacteria that promote decay in pits and fissures. The fact that 90 percent of the teeth in this study were either protected from caries with sealants that remained intact or caries did not develop, when the sealant was lost, was very encouraging.

The loss of sealants is one of the excuses given by those who do not use them. It is felt by some that "They do not last long in the mouth."<sup>15</sup> There are concerns

Table 3 □ Replacement procedures of original sealant.

Procedure	Frequency	Percent	Cumulative frequency	Cumulative percent
Nothing	6192	78.6%	6192	78.6%
Reseal (13510)	1040	13.2%	7232	91.8%
1 surface composite (23300)	513	6.4%	7745	98.2%
1 surface amalgam (21400)	75	1.0%	7820	99.2%
2 surfaces or greater	57	0.8%	7877	100.0%

Table 4 □ Procedures performed compared to average ages.

Procedure (Code)	Average age at sealant placement	Average age at procedure	Last-visit age
Nothing	10.55 yr.	—	12.33 yr.
Reseal (13510)	9.31 yr.	11.06 yr.	12.93 yr.
1 surface composite (23300)	10.30 yr.	11.87 yr.	13.78 yr.
1 surface amalgam (21400)	11.78 yr.	13.98 yr.	13.98 yr.

about this matter because replacement can become a dilemma in a busy practice. Other concerns are whether to charge or not to charge and whether patients will readily accept sealants if they understand that they may have to be replaced in a short period of time. The permanency of the sealants in this study was also a matter of concern, since in many instances, the sealants were placed when isolation of the teeth to be sealed was less than ideal. Many of the sealants were placed without rubber dams, due to the partial eruption of many of these teeth. It could be concluded as surprising that the results are as favorable in terms of retention of the sealants as they are. In regard to salivary contamination, Feigel suggested that clinicians use bonding agents, such as ScotchBond Dual Cure (3M), on surfaces wet with saliva.<sup>16</sup> This was as successful as sealants done using a standard protocol of etching, drying, and maintaining the dry field after cleaning the tooth.

In the younger children with first permanent molars, the need for retreatment may be as much of a function of the child's ability or willingness to open fully and remain open for the duration of etching, cleaning, and placement of the sealants. The most effective isolation, of course, is rubber dam, but full eruption of the tooth is necessary for this to be attempted and the period of jeopardy of the pits and fissures would consequently be extended. Most sealants are placed, therefore, with some form of cotton-roll isolation. The effectiveness of this technique depends on the cooperation of the patient in opening wide and on the amount of saliva produced.

Whether sealable surfaces should be left uncovered to develop caries until complete eruption of these teeth is



a question of judgment, because partial sealants may become a source for marginal leakage and caries development.

Another concern in the evaluation of sealants is the detection of transparent sealants. Recent use of opaque sealants indicates that opaque sealant will facilitate the evaluation of these restorations. The cost of sealant failures and their replacements cannot be overlooked. With the dental bills being paid through prepayment plans this concern would be primary to an insurer. Also with a further decline in caries prevalence the economics of sealants may be questioned. In this regard there has been little evidence that fluoride and brushing have decreased the prevalence of caries in pits and fissures, particularly in permanent molars. It has been proposed that the charge for sealants should be the same as for an amalgam restoration and no replacement charge be made for the sealant for eight to ten years. Some insurers and patients might have trouble with this concept.

In regard to the sealants placed on incompletely erupted teeth there is some concern that no sealant is better than an improperly placed sealant.<sup>17</sup> Of the 513 teeth that were retreated with preventive resin restorations or Class I composites, it is the impression of the investigator that these were substantially in buccal pits of mandibular molars and the distal lingual grooves and pits of maxillary molars, which were probably not accessible to the clinician at the time the sealants were being placed: such as the buccal pit below the gingival margin, and the distal of the maxillary tooth covered by the operculum.

Dennison *et al* found that molars treated with an operculum covering the distal marginal ridge were twice as likely to require retreatment than teeth sealed when the gingival tissue is immediately adjacent to the ridge. They go on to advise that the data for caries rates indicate the value of placement of sealants as soon as the tooth has erupted enough to allow effective isolation. This suggests placement in the first two years after expected eruption should be a part of a sealant benefit program. It was significant that this study found that the earlier sealants were placed in teeth, the more likely that retreatment would be necessary (Table 2). These findings bring into question the efficacy of early placement of sealants, when the need for replacement is higher than expected.

## CONCLUSIONS

- ☐ Further evaluation of placement of sealants in partially erupted permanent molars when vulnerable pits and fissures are exposed to food and bacteria should be undertaken.
- ☐ Sealants have proven to be successful in the prevention of pits and fissure caries in permanent molars, some for as long as eight years.

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# NURSING CARIES

## Parents and nursing-bottle caries

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**D**espite the success of preventive dentistry, there is a growing number of reports of a decline in the quality of very young children's teeth.<sup>1,2,4-7</sup> One frequently mentioned cause is the use of a baby bottle. Using a bottle filled with sugared juices, baby's teeth are constantly exposed to fermentable carbohydrates. The resulting so-called nursing bottle caries affects the lingual surfaces of the maxillary primary incisors and the occlusal surfaces of the first primary molars of infants under the age of three years.<sup>1,4</sup> Furthermore it is believed that these children use a bottle up to a higher age. The number of children suffering from this form of dental decay in Western-type countries is estimated at 5 percent of the child-population, depending on factors such as the country in which the phenomenon is investigated, the race of the child and the degree of urbanization.<sup>4</sup>

In most research concerning nursing bottle caries, the problem is addressed mainly from a dental viewpoint. The focus of these studies is on factors that have a direct influence on the quality of the teeth. Examples of such factors are the contents of the bottles and the frequency with which the teeth are cleaned. This line of research gives only partial insight, however, into the problem. Although an understanding of biological and behavioral processes that have a direct impact on the teeth is needed, it is not sufficient. To fully understand the phe-

nomenon and, more importantly, to be able to prevent its disastrous effects, it is equally important to investigate factors that have an indirect influence on the quality of the teeth. Examples are the reason why the bottle is given in the first place and the time of day the bottle is given. Focusing on these factors, we enter the domain of psychology.

The purpose of this explorative study is to map not only the dental factors, but also the psychological mechanisms that are involved in nursing bottle caries. Because parents are crucial to the child's early development, their role is emphasized.<sup>3</sup> Attention is also given to the parents' parenting style.

The focus of this study is summarized in the following questions:

- ☐ Is it possible to distinguish parents who give their child(ren) a bottle from parents who do not?
- ☐ Why do parents give their child(ren) a bottle up to a higher age?
- ☐ Is it possible to distinguish parents with a child that suffers from nursing bottle caries from parents with a child that does not?
- ☐ Do children that suffer from nursing bottle caries differ from children that do not?

### MATERIALS AND METHODS

A questionnaire consisting of five sections was constructed. The first section covered the general (health)

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condition of the child. The second section was devoted to aspects concerning the teeth of the child. In the third section, questions were asked about the parents' behavior and attitudes concerning their personal dental hygiene and their concerns about their child's teeth. The purpose of the fourth section was to identify the dominant parenting style used by the parents. The last section consisted of items that measured background variables. For each section, some examples of questions are listed in Table 1.

The construction of most of the items was based primarily on both psychological and dental theories concerning nursing bottle caries. The questionnaire was supplemented with questions that were derived from personal interviews with dentists who are in practice, parents of children who came to an infant health center for the first time and interviews with parents of children who would receive dental treatment in the near future. The final version of the questionnaire was pretested, moreover, at an infant health center.

The questionnaire was mailed to the parents of sixty-eight children, varying in age from eight months to three years, who were treated for nursing bottle caries at a dental clinic in one of three Dutch cities (Amsterdam, Arnhem or The Hague). Another ninety parents of children in the same age, but with no known clinical history regarding dental problems, received the questionnaire during the half-yearly check-up from employees of three infant health centers. The goal was to obtain three groups of respondents: a group consisting of parents of children who suffered from nursing bottle caries (the so-called 'caries group'); a group consisting of parents with children who receive a bottle on a regular basis but were never treated for dental problems (the so-called 'non-caries group'); and a group consisting of parents of children who have never used a bottle (the control group).

To check whether there is a difference in the distributions of the three groups on (some of) the variables and to check whether a relationship exists between the classification variable 'Group' and (some of) the variables of the questionnaire, the collected data will be analyzed, using the two-way chi-square test statistic.

## RESULTS

The response-rate for the two groups of parents was moderate: twenty-seven of the sixty-eight parents who were selected at the clinics and forty-six of the ninety parents who were selected at the infant health centers did send back the questionnaire.

Contrary to expectation, an initial analysis showed that

Table 1 □ Examples of items that appeared in the questionnaire. For each section a short description of its purpose is given, along with some examples of questions that were asked.

Section	Examples
1. General (health) condition of the child	<ul style="list-style-type: none"> <li>- "Up until now, how often has your child been sick?"</li> <li>- "Does your child have difficulties falling asleep?"</li> </ul>
2. Aspects related to the teeth of the child	<ul style="list-style-type: none"> <li>- "Do or did you give your child a nursing bottle?"</li> <li>- "What is the content of the bottle generally?"</li> </ul>
3. Parents and dental hygiene	<ul style="list-style-type: none"> <li>- "What is your opinion of the quality of your teeth?"</li> <li>- "Did you receive education concerning dental hygiene?"</li> </ul>
4. Parenting style	<ul style="list-style-type: none"> <li>- In this section ten short stories were presented. In each story a fictional situation was described, in which a child displayed some sort of negative behavior. Respondents were asked how they would react if they were placed in that situation.</li> </ul>
5. Background variables	<ul style="list-style-type: none"> <li>- "Are you employed?"</li> <li>- "Do you have a partner?"</li> </ul>

only four parents in the last group have never given their child(ren) a bottle. A somewhat disturbing preliminary conclusion that can be drawn from this finding is that using a bottle seems commonplace, which in turn means that the population of potential victims of nursing bottle caries could be larger than estimated at the present moment.

The low number of 'non-bottle users' also meant that the control group could not be created, thus making it impossible to answer the question whether parents who give their child(ren) a bottle differ from parents who do not.

Table 2 shows the results of the two-way chi square tests for a relationship between group membership and the variables of the questionnaire. Because of the large number of tests performed, all effects were tested against  $\alpha = .005$ . Only the most relevant differences are reported.

Although the differences concerning the reasons why parents give their child(ren) a bottle for a prolonged period of time did not reach statistical significance ( $\chi^2(3) = 9.53$ ;  $p < .023$ ), parents in the caries group showed a tendency to give the bottle out of health considerations (e.g. the bottle as a substitute for breastfeeding or as extra feeding). Parents in the non-caries group on the other hand, give more reasons indicating they are forced to continue to give the bottle because of negative social



Table 2 □ Most important results of the two-way chi square tests. Distribution in answers to the listed questions/variables are tested as function of group membership. All effects are tested against  $\alpha = .005$ .

Testing of group membership by:	$\chi^2$ -value (Pearson)	df	p-value*
Reasons for giving the bottle	9.53	3	.023
Number of attempts to stop giving a bottle	9.86	1	.002
Number of successful attempts	13.12	2	.001
Did the mother breastfeed the child?	8.80	1	.003
Did the child receive a bottle from birth?	10.06	1	.002
Contents of the bottle	10.30	1	.001
Carbohydrates through other nutrients?	9.30	1	.002
Time of day the bottle is given	23.26	1	.000
Are both parents employed?	12.52	1	.000
Education of the partner (father)	13.55	2	.001
Parenting style as measured by scenario's	1.49	2	.476
Age of the child	34.23	3	.000
Total number of times the child was sick	21.12	2	.000

\*Significant if  $p < .005$

behavior of the child (e.g. nagging and whining). This result is probably related to the fact that although parents of caries children more often try to stop giving a bottle ( $X^2(1) = 9.86$ ;  $p < .002$ ), their attempts are less successful than the less frequent, but more successful attempts of parents of noncaries children ( $X^2(2) = 13.12$ ;  $p < .001$ ).

In comparison with the non-caries group, relatively fewer parents in the caries group have breastfed their children ( $X^2(1) = 8.80$ ;  $p < .003$ ), while more caries children received a bottle straight from birth ( $X^2(1) = 10.06$ ;  $p < .002$ ). Moreover, the bottles of the caries children more often contain sugared drinks ( $X^2(1) = 10.30$ ;  $p < .001$ ). These children also receive more carbohydrates through other nutrients, for example food and candy ( $X^2(1) = 9.30$ ;  $p < .002$ ). Another interesting finding is that the parents in the non-caries group give the bottle more often during the daytime, whereas the parents in the caries group give the bottle both during the day and at night ( $X^2(1) = 23.26$ ;  $p < .001$ ). The background variables showed that more often both parents of non-caries children are employed ( $X^2(1) = 12.52$ ;  $p < .001$ ) and that the partners of the respondent-parent, in almost all cases the father, on the whole have a higher level of education ( $X^2(2) = 13.55$ ;  $p < .001$ ). The two groups of parents did not differ in applied parenting style ( $X^2(2) = 1.49$ ;  $p < .476$ ).

Finally, caries children are older than non-caries children ( $X^2(3) = 34.23$ ;  $p < .001$ ) and these caries children are sick more often than non-caries children ( $X^2(2) = 21.12$ ;  $p < .001$ ).

## DISCUSSION

In this section the results will be combined in order to be able to answer the questions that guided this study. Moreover, attention is given to the implications these answers have on an understanding of the phenomenon of nursing bottle caries.

The combination of results indicates that the primary reason why parents give their child(ren) a bottle up to a relatively high age, is that the use of the bottle has become a habit. Because parents of caries children have more trouble breaking with this habit, perhaps due to a combination of a very demanding child and a not so very persistent parent, the habit is stronger in that group. The inability to stop giving the bottle can ultimately result in the use of a bottle up to a relatively high age, which in turn increases the chances of developing nursing bottle caries.

The analysis showed that parents of a child that suffers from nursing bottle caries differ from parents of a child that does not in a number of ways. First of all, the findings that in the caries group more parents have given a bottle straight from birth and, in contrast, fewer parents have breastfed the child, suggest that caries children have been exposed longer to the possible effects of the bottle than non-caries children. These findings contradict the results of earlier research, where it was demonstrated that the prevalence of nursing bottle caries was higher for children who were weaned from birth.<sup>2,6,7</sup> Furthermore, because, parents of caries children, in contrast to parents of non-caries children, more often fill the bottles with sugared drinks, which they give both during daytime and at night, the use of a bottle can be more detrimental to the teeth of caries children than to the teeth of non-caries children. In line with previous investigations, it was found that caries children receive more carbohydrates through other nutrients, making their teeth even more vulnerable.<sup>2,4,7</sup>

Contrary to expectation, no differences in parenting style were found. One explanation for this is that parenting style is not related to nursing bottle caries. Another explanation is that this part of the questionnaire did not measure parenting style adequately. Because these questions were only validated at face-value, we tend to prefer the last explanation.

The last question that needs to be answered is whether children that suffer from nursing bottle caries differ from children that do not. The results showed that caries and non-caries children differ in two respects. First, caries children on the whole are older than non-caries children. Similar results were reported by Tsu-



bouchi *et al* (1994) and Roberts *et al* (1993). Second, the caries children have been sick more often. The last difference remains significant, even when correcting for age differences between the groups. Although it seems plausible that these two phenomena are related, the direction and/or magnitude of the relationship is yet unclear.

Based on the differences found, the above given characterization of both caries children and their parents can be helpful in identifying high-risk groups. These profiles can also be used in setting up educational programs for high-risk parents, whereby the programs should concentrate, not only on dental/medical education, but also on aspects of the behaviors and attitudes towards dental hygiene of both parent and child that are indirectly detrimental to the quality of the teeth of the children.

## CONCLUSIONS

- ☐ Habit, and the inability to break with it, seem to be the main reasons why parents give their child(ren) a bottle up to a relatively high age.
- ☐ Parents of children who suffer from nursing bottle caries differ from parents of children who do not suffer from this form of dental decay in both dental/medical and psychological-behavioral ways, most of which have a negative influence on the quality of the children's teeth.
- ☐ Because of the explorative nature of this study, some concepts (e.g. the parenting style applied by

the parents and the relationship between the age of the child and the child's medical history) need to be studied in greater detail.

- ☐ Based on differences between the caries and the non-caries groups, an educational program should be developed in order to stop the use of a baby bottle as soon as possible. This program must be aimed primarily at changing the parents' attitudes and behaviors toward the dental hygiene of their children.

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## SOCIOECONOMIC INEQUALITIES IN CHILDREN'S CARIES EXPERIENCE

Furthermore, the universal no-cost nature of dental care should reduce the potential for providers' restorative-decisions to vary substantially among socioeconomic status (SES) groups and thereby create systematic biases in the filled components of DMFS or dmfs values. Nonetheless, these findings demonstrate that SES inequalities have not been eliminated among children who are recipients of school dental care.

The interpretation of SES as a risk indicator for dental caries must rest on an underlying causal mechanism. In this instance it may be that lower SES groups have a greater rate of caries attack (related either to more frequent sugar consumption or the presence of more cariogenic bacteria), or that they have reduced resistance to caries attack (due to the structure and chemical composition of their enamel or because of other intraoral defense mechanisms such as saliva).

Slade, G.D. *et al*: Influence of exposure to fluoridated water on socioeconomic inequalities in children's caries experience.

*Community Dent Oral Epidemiol*, 24:89-100, April, 1996.

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# PHYSICAL ABUSE

## A study of age-related variables among physically abused children

Stephen A. Jessee, DDS  
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**T**he dramatic increase in the incidence of child abuse and neglect has had far reaching effects upon our society. During 1994, over 3.1 million children were reported to Child Protective Services agencies as suspected victims of child maltreatment, a 63 percent increase in reported cases since 1985.<sup>1</sup> While there has been an increase in the actual incidence of abuse and neglect of children, these figures also represent an increased awareness by society, as a whole, and the efforts of many concerned health professionals. Although neglect represents the most prevalent type of child maltreatment (50 percent), physical abuse is found in approximately one out of every five substantiated cases of child abuse or neglect and is responsible for over 50 percent of the child-abuse-related deaths every year.<sup>1,2</sup>

A review of the literature on this subject cites three major hospital studies that investigated the incidence of physical injury to the head and neck.<sup>3-5</sup> In each of these studies, injuries to the head, face, mouth and neck were found in 65 to 75 percent of the cases where children had been physically abused. These data imply that dentists may come into contact with a significant number of abused children and need to be alert, therefore, to the

signs and symptoms of this form of child maltreatment. Each of the previously mentioned hospital studies has focused on an overall evaluation of the frequency of injuries to children in general. It is the purpose of this article to present additional information, obtained in a retrospective hospital study, regarding certain age-related variables among children who were suspected or known to have been physically abused.

### MATERIALS AND METHODS

The data presented in this article were obtained from a review of the charts of 266 children, newborn to seventeen years of age, who were brought to Texas Children's Hospital during 1993 and 1994, suspected to have been physically abused and, subsequently, reported to Children's Protective Services (CPS). Hospital protocol dictates that physicians are to request a consultation between a staff social worker, the injured child, and the child's family, if following an examination, there is reason to believe that the injury to the child is nonaccidental. Subsequent to an oral report, a case worker is assigned by CPS. Documentation that was entered into the respective charts by the attending physician, nurses, and both hospital and CPS social workers was the basis for information gathered in this study.

Texas Children's Hospital, the largest free-standing pediatric institution in the United States, follows the definition of physical abuse set forth in the Texas Family Code as "physical injury that results in substantial harm

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to the child, or the genuine threat of substantial harm from physical injury to the child, including an injury that is at variance with the history or explanation given and excluding an accident or reasonable discipline by a parent, guardian, or managing or possessory conservator that does not expose the child to a substantial risk of harm."<sup>6</sup> Children who were believed to have been the victims of any of the other forms of child maltreatment were not included in this study.

For the purpose of this study, data gathered were divided into both demographics and physical findings. Demographic information included age, gender, parental status, suspected perpetrators, and history of any previous abuse. Children were assigned to one of the following age-groups: Group 1,  $\leq$  one year old; Group 2, two to five years of age; Group 3, six to twelve years of age; and Group 4, thirteen to seventeen years of age. Physical findings included location(s) of injury (head, face, mouth, neck, and body) and type(s) of injury sustained. Cases were referenced by hospital chart number to insure confidentiality. One investigator (SAJ) performed all chart reviews, thereby assuring the standardization of all information presented. The study was approved by both the Committee for the Protection of Human Subjects of the University of Texas Houston Health Science Center and the Texas Children's Hospital Pediatric Clinical Investigations Subcommittee of the Baylor College of Medicine Affiliated Review Board.

## RESULTS

While the body, designated as any part of the anatomy below the neck, was injured in the greatest number of cases (164), trauma to the head, face, mouth or neck was found in two-thirds of all cases (66.9 percent). Many cases involved injuries to more than one anatomical site (72), as well as multiple types of injuries (65). There was no significant difference in the incidence of cases involving either multiple injury locations or multiple types of injuries between any of the age-groups. The total number of children in each of the respective age-groups is shown in Table 1. Of the 151 boys and 115 girls included in this study, no significant difference in the incidence of physical abuse was found between the incidence of male children and that of female children at any age. The mean age for the 266 children was 3.02 years. Every child was examined by a hospital physician. A dentist was involved, in an advisory capacity, in only one case.

The percentage of cases involving injury to the body was similar for all age-groups. Over three-fourths (78

Table 1 □ Distribution of cases by age (N = 266 cases).

Group number	Age	Number	Percentage
1	$\leq 1$	159	59.8
2	2-5	77	28.9
3	6-12	24	9.0
4	13-17	6	2.3

percent) of the children who presented with head injuries were less than or equal to one year of age (Group 1). Approximately 90 percent of the cases exhibiting facial injuries were equally distributed between Groups 1 and 2. The ten cases of injuries to the neck and the seven incidences of intraoral trauma were confined to Groups 1, 2, or 3.

Three out of every five households of the children reported in this study were headed by single females. In 37 percent of the cases, the parents of the children were married and resided in the same household, while only seven cases involved a child who lived with a divorced, separated or single male. The biological mother or the biological father, stepfather or mother's boyfriend, when compared as two groups, were suspected or known to have inflicted the abuse in relatively equal proportions upon children under the age of six. As the child reached school age (Group 3), the incidence of injury exacted by the biological mother increased, along with the sudden emergence of abuse by other unrelated juveniles. Teen-age children (Group 4) were found to have been abused by either mothers or fathers, stepfathers or mothers' boyfriends, or another relative.

Cases involving injuries to various parts of the body (head, face, mouth, neck and body) within each age-group are found in Table 2 in decreasing order of frequency. Since many of the children had more than one injury site, the total number of injuries exceed the actual number of cases for each age-group. Although the body was injured most often in all age-groups, each group exhibited a distinctive pattern of injury with regard to the other anatomical locations. In Group 1, injury to the head, in the form of fractures or subdural hematomas, was most prominent. Facial injury became more common for children between the ages of two and five while the incidence of injury to the head declined. Group 3, taking into consideration the limited number of cases, showed a somewhat even distribution of injuries to the head, face, mouth, and neck. The few instances of physical abuse incurred by the children of Group 4 that were not confined to the body, were contusions or abrasions/lacerations to the face.



Table 2 □ Distribution of injuries by location.

Group 1: ≤ 1 year old (N = 159 cases)		
Location	Number	Percentage
Body	91	57.2
Head	64	40.3
Face	35	22.0
Neck	2	1.3
Mouth	1	0.6
Group 2: 2-5 years of age (N = 77 cases)		
Location	Number	Percentage
Body	51	66.2
Face	36	46.8
Head	13	16.9
Neck	5	6.5
Mouth	2	2.6
Group 3: 6-12 years of age (N = 24 cases)		
Location	Number	Percentage
Body	17	58.3
Face	6	25.0
Head	5	20.8
Mouth	4	16.7
Neck	3	12.5
Group 4: 13-17 years of age (N = 6 cases)		
Location	Number	Percentage
Body	5	83.3
Face	2	33.3
Head	0	0.0
Mouth	0	0.0
Neck	0	0.0

Table 3 □ Distribution of injuries by type.

Group 1: ≤ 1 year old (N = 159 cases)		
Type	Number	Percentage
Fracture	93	58.5
Burns	25	15.7
Contusion/Echymosis	23	14.5
Abrasion/Laceration	9	5.7
Group 2: 2-5 years of age (N = 77 cases)		
Type	Number	Percentage
Contusion/Echymosis	34	44.2
Fractures	20	26.0
Abrasions/Lacerations	20	26.0
Burns	14	18.2
Group 3: 6-12 years of age (N = 24 cases)		
Type	Number	Percentage
Contusion/Echymosis	13	54.2
Abrasion/Laceration	8	33.3
Fractures	2	8.3
Burns	2	8.3
Group 4: 13-17 years of age (N = 6 cases)		
Type	Number	Percentage
Contusion/Echymosis	5	83.3
Abrasion/Laceration	1	16.7
Fractures	1	16.7
Burns	0	0.0

The type of injury occurring most often, from a numerical standpoint, was contusions/ecchymosis (bruising), which represented over one-third of all injuries reported. Other injuries, in decreasing frequency, were fractures, burns, abrasions/lacerations, and subdural hematomas. Of the 266 children in this study, more cases (116) involved fractures than any other form of injury. Other injuries and their respective case totals were contusions or ecchymosis (75), burns (41), abrasions or lacerations (35), and subdural hematomas (20).

Table 3 presents the distribution, by case numbers, of the occurrence of the four most common types of injuries found in this study for each of the four age-groups. In Group 1, more cases involved fractures than the total number of cases for the other three leading types of injuries combined. More than 60 percent of all the children who presented with burns were found in this age-group. Although there were more incidences of contusions/ecchymosis among the preschool children of Group 2, this group alone exhibited a substantial number of cases for each of the four most prevalent forms of physical injury. In Group 3, the percentages for bruises and abrasions remained steady while the number of cases of both fractures and burns declined. Of the six teenagers found in Group 4, all but one displayed bruising

to either the body or face.

A composite of the most commonly occurring injuries representing both type and location for each age-group were:

Group 1: fractures of arms, legs or skull, subdural hematomas, and burns to the body.

Group 2: contusions/ecchymosis of the body or face, fractures of the body, and abrasions/lacerations to the face.

Group 3: contusions/ecchymosis of the body, abrasions/lacerations of the body or mouth.

Group 4: contusions/ecchymosis of the body or face.

Although the greatest number of cases involved trauma to the body, the face incurred the highest incidence of injuries. The most common form of facial injury for each of the age-groups was contusions or ecchymosis to either the cheek, forehead, periorbital area or lip. All eight cases of retinal hemorrhage were isolated in children under the age of two. Cases involving mandibular fractures or tears of labial or lingual frenums were not found among any of the 266 charts reviewed.

There were forty-four children who were diagnosed as having been previously abused. For Groups 1, 2, or 3, approximately one out of every six children showed signs of previous physical injury, while three of the six



children in Group 4 appeared to have been physically abused on more than one occasion.

## DISCUSSION

Injury to the head, face, mouth and neck are common occurrences in cases of physically abused children. The fact that 177 of the 266 cases reviewed had some form of injury to either one or more of these anatomical locations supports this statement. Other similar hospital or random population studies have reported comparable findings.<sup>3-5,7-10</sup> This high incidence of orofacial trauma points out the opportunity that dentists may have to assist in the fight against child maltreatment, through proper diagnosis and subsequent reporting.

Criteria used to decide which children would be grouped together included degree of dependence by the child upon the parent(s), physical and mental maturity, and level of education. One-half of the children included in this study were under the age of two. This finding is supported by other studies.<sup>7,11</sup> Cameron reported that 79 percent of the children were under the age of two, with 55 percent less than one year old.<sup>7</sup> The high incidence of physical abuse at this early age may be due, in part, to the demands placed upon the parent(s) of such a child. The reverse of this theory may explain why there were so few children reported for the thirteen to seventeen-year age-group. Many older children may be seen by physicians or dentists in private offices or at other hospitals that treat patients of all ages. Although there were more boys than girls in this study, there was no predilection for physical abuse of either males or females.

Almost 60 percent of the children lived in households headed by a single female. Although it was not the intent of the authors to investigate the financial status of each child's family nor to stereotype all single parent families as being low income, it is our belief that many of the children in single parent households probably did live in conditions that can be described as economically stressful with little or no support financially or for services that would be beneficial to the entire family. Findings in a 1994 survey of all fifty states identified economic stress and poverty, along with substance abuse, as two problems that contribute to the likelihood for abusive behavior to occur within a family.<sup>1</sup> Factoring these elements in with a young, isolated, already susceptible parent may lead to a highly volatile situation in which a child is physically injured.<sup>12-14</sup> While biological mothers and biological fathers were implicated equally in the physical abuse inflicted upon children under the age of two, the

involvement of the mother, as the abuser, increased up to the teenage years. This finding is not surprising due to the above mentioned preponderance of female single-parent families. In some instances, a divorced or single mother may be living with a man who may be responsible for the abusive action.<sup>12</sup> This study found that step-fathers or mother's boyfriends were known or suspected to have injured children in 10 percent of all cases. Gallo stated that one parent or adult is usually the abuser, while the other parent or adult takes a passive role, allowing the abuse to continue.<sup>15</sup>

Injury to the body occurred in over 50 percent of the cases in each of the four age-groups (Table 2). In Group 1, trauma to the head was found in 64 out of the 159 total cases (40.3 percent). Overall, this represents over three-fourths of all the cases involving injury to the head in the entire study. Most of these injuries were fractures and/or subdural hematomas. In a study by Helfer *et al*, 80 percent of the 246 infants or young children who had accidentally fallen from their cribs or beds had no physical injuries. Only 1 percent of such falls had skull fractures.<sup>16</sup>

Ten of the eighteen cases of subdural hematoma had no associated skull fracture. This finding is consistent with other studies.<sup>10,11,17,18</sup> Group 2 showed a dramatic increase in the percentage of cases with injuries to the face, as well as a decline in the number of head injuries, when compared to children under the age of two. At this age, children have begun to communicate orally their needs and feelings. In a stressful situation, a parent may strike out at the child to silence them, physically transmitting his or her anger to the child's face or head. This area of the body is often thought of as representing the individual or self.<sup>11,19</sup> The face, head, mouth and neck were each injured in a significant number of cases involving children between the ages of six and twelve (Group 3). The fact that the children in this age-group were better able to defend themselves might explain the randomness, with regard to location, of their injuries. The six cases of physical abuse in Group 4 involved injuries to either the body or face. The normal, healthy challenge of parental authority by adolescents can often set off a violent, abusive response from the parent.<sup>4</sup> The number of injuries to the neck and mouth were low to nonexistent for children in the various age-groups. It is inconceivable how so few cases of intraoral injuries could have been found, when almost one-half of all facial trauma occurred to either the cheek, lip or nose. Many injuries to the mouth may have been overlooked, because every child was examined exclusively by a physician rather than in conjunction with a dentist, who



would be expected to be more familiar with the oral cavity. Other hospital studies have also cited this opinion.<sup>3,4</sup>

Although contusions or ecchymosis had the highest incidence of occurrence, more cases included fractures than any other type of injury. Table 3 lists the case totals of the four most commonly occurring types of injuries by age-group, allowing for evaluation of and comparison between the children of different ages. Almost 60 percent of children under two years of age were diagnosed with one or more fractures. Schmitt reported that bone trauma occurs in 10 percent to 20 percent of all physically abused children.<sup>20</sup> Burns were the second most common nonaccidental injury for this age-group. Other authors have suggested that burns are present in approximately 10 percent of physical abuse cases.<sup>9,21</sup> The high incidence of both fractures and burns for these infants may be partially explained by their total inability to fend off any abusive attack. After a child reached the age of two, contusions replaced fractures as the most frequently occurring injury. This type of injury was three times more prevalent for the children of Group 2 than for those in Group 1. Other frequently occurring soft tissue injuries were abrasions or lacerations and burns. O'Neill stated that soft tissue injuries represented the earliest signs of physical abuse.<sup>11</sup> Contusions or abrasions were present in twenty-one of the twenty-four children between the ages of six and twelve. The number of cases involving fractures and burns was very low. The increased mobility and physical maturity of the children in Group 3 may explain, in part, why the majority of their injuries were of a less severe or life-threatening nature. Similar soft tissue injuries were found among the adolescents in Group 4. A study by Baetz *et al* found bruises to be the most common injury in abused children.<sup>10</sup> Needleman concurred when he stated that soft tissue injuries, predominantly bruises, were the most frequent injury incurred in cases involving physical abuse.<sup>22</sup>

When taking each separate injury site into consideration, the face was the most often injured area of the body. da Fonseca and associates reported similar findings.<sup>4</sup> The percentage of cases with facial trauma ranged from a low of 22 percent for Group 1 to a high of 46.8 percent for preschool children in Group 2, with contusions/ecchymosis being the most frequently occurring type of injury. This high incidence of facial bruising was also described by Becker *et al* in the findings of their hospital study.<sup>3</sup> The cheek and forehead were favorite targets for facial trauma. A unique ocular injury that often occurs when an infant has been either violently shaken or has received a direct blow to the skull is ret-

inal hemorrhaging. This study uncovered eight cases of retinal hemorrhage, all involving children who were less than two years old. The presence of such an injury in combination with other unexplained trauma strongly suggests that an abusive episode has occurred.

Statistics indicate that if a previously abused child is returned home without intervention (e.g., reporting or family therapy), 5 percent are killed and 35 percent are seriously reinjured.<sup>23</sup> Of those children in this study who had signs of previous physical abuse, many had fractures and/or numerous injuries at multiple locations. This finding indicates that as the frequency of abuse increases so does its severity. Each of the four age-groups included children who were victims of a previous physical assault. Hamilton reported that an abusive parent rarely returns to the same pediatrician or emergency room, when his or her child needs medical attention.<sup>24</sup> This elusive behavior makes it difficult to document a history of abuse.

## CONCLUSION

The following conclusions can be drawn from the data presented in this paper:

- ☐ In cases of child abuse there is a decrease in the frequency of injury with an increase in age.
- ☐ The severity of physical abuse is greatest in infants and young children who are less able to defend themselves and whose capacity to withstand trauma is minimal.
- ☐ Age appears to be a factor with regard to both type and location of the injuries associated with physical abuse.

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### HOW TO STAND FOR CHILDREN EVERY DAY

1. Make time for family time.
2. Limit your child's exposure to violent television programs, movies, and video games. Read to your child and encourage your child to read.
3. Get involved in your child's school. Provide homework help and encouragement.
4. Join or create neighborhood parenting groups. Share experiences and support.
5. Take personal responsibility for helping at least one child besides your own.
6. Urge your employer, congregation, civic groups, and others to place a high priority on meeting children's physical and emotional needs.
7. Join with other parents and citizens to urge your local state, and federal government to invest first in children.

Stand for children. CDF Special report, 17:5-12, June-July 1996.

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# HEALTH EDUCATION

## Using a children's dental health carnival as a primary vehicle to educate children about oral health

Stanton D. Harn, PhD  
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**F**or the past seven years, the University of Nebraska Medical Center College of Dentistry has hosted a Children's Dental Health Carnival. The model for the carnival was previously presented in the *Journal of Dentistry for Children*.<sup>1</sup>

The goal of the carnival was to educate children and their parents/guardians about dental health in a fun environment. Each of the previous carnivals featured thirty-five to thirty-eight different sequenced events: screenings, educational booths, educational games, fun games, entertainment events, and product promotional booths.

The authors maintain that a properly organized dental carnival can be a very effective vehicle, if not the most effective vehicle, for educating children about oral health. The purpose of this study is to present findings of a survey with the hope of providing insight as to the benefit of using a carnival as a primary educator of dental health for children.

### METHODS AND MATERIALS

From a pool of approximately 3,000 carnival attendees (children and adults), 300 adults were randomly chosen and then matched with a city directory in order to obtain

addresses. The 300 adults were mailed a six-page, twenty-two-question evaluation form in a self-addressed, stamped envelope. Respondents who brought more than one child were asked to complete the survey based on the "average" influence of the carnival for all children attending.

The questionnaire consisted of the following categories: 1) demographics, 2) entertainment and educational events, 3) educating children and adults about oral health, 4) oral health outcomes, and 5) overall evaluations.

### RESULTS

#### Response rate

A total of 164 of 300 surveys were received from respondents for a response rate of 54.7 percent, regarded by Babbie as an "adequate" to "good" response rate for data analysis.

#### Respondent characteristics

Respondents averaged 35.7 years of age and 86.6 percent were women. The average age of the children attending was just over five years (boys, 5.4; girls, 5.1). Ninety-four percent of respondents were parents/guardians, the remainder being friends, neighbors or grandparents of the children. Sixty-two percent of the respondents had attended one or two carnivals.

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## Educational and entertainments events

Table 1 presents ratings on how successful events/characters were in entertaining and educating children. Respondents rated each event/character, using a five-point scale from 1 (very unsuccessful) to 5 (very successful). The puppet show Dr. Sluggo and videotape all received ratings at or above 4.0 for both entertaining and educating. The costumed characters other than Dr. Sluggo were rated as being more successful in entertaining than educating.

## Educating children and adults about oral health

Respondents, using the same five-point scale mentioned earlier, rated how successfully the carnival educated children in the following elements of oral health. Average ratings are listed after each element:

- ☐ Toothbrushing (4.4).
- ☐ Flossing (4.1).
- ☐ Nutrition (4.1).
- ☐ Knowledge of teeth (3.7)
- ☐ Process of tooth decay (3.7).

Respondents also rated on the five-point scale how successfully these specific carnival booths informed them (adults) about good dental health:

- ☐ Nutrition for a smile/real snack attack (4.2).
- ☐ Thumbsucking (4.2).
- ☐ Fluoride/sealants (4.1).
- ☐ Ask your dentist (4.1).
- ☐ Concept of tooth decay (4.1).
- ☐ Tooth development (3.9).

Overall, respondents rated on a four-point scale the educational experience of the carnival at an average of 3.3, between "3 — above average" and "4 — outstanding."

## Entertaining children

Using a three-point scale of "1 — not fun," "2 — fun," and "3 — very fun," respondents rated the carnival events designed primarily to entertain with minimal or no educational component. Table 2 lists these ratings. All events were rated between fun and very fun with toys/prizes, balloons and action games receiving the highest ratings.

## Oral health outcomes

Respondents rated as 0 ("not improved at all"), 1 ("improved some") or 2 ("improved greatly") the extent to which attending the carnival improved toothbrushing,

Table 1 ☐ Success of entertainment and education events

Event	Success in Entertaining	Success in Educating
Puppet show	4.2	4.0
Dr. Sluggo ('Superman of dentistry')	4.1	4.0
Count Plaqla and Strep Mutans costumed characters	4.1	3.8
Tooth fairy	4.1	3.4
Videotape — "Dudley the dinosaur's trip to the dentist"	4.1	4.0
Dinosaur adventure	3.8	3.5

### Rating scale:

- 5 = Very successful
- 4 = Successful
- 3 = Uncertain/Not sure
- 2 = Unsuccessful
- 1 = Very unsuccessful

Table 2 ☐ Quality of entertainment events

Event	Rating
Face painting	2.1
Balloons	2.5
Toys/Prizes	2.7
Hit the bad tooth (bean bag toss)	2.5
Make those germs squirm (sponge throw)	2.4
Stick with clean teeth (velcro ping-pong ball throw)	2.1
Baby tooth booth (ducks in the pond)	2.1
What's in my mouth (put hands in mouth and feel)	2.0
Smack the plaque (hit board with mallet)	2.3

### Rating Scale:

- 3 = Very fun
- 2 = Fun
- 1 = Not fun
- 0 = Do not know/did not participate

Table 3 ☐ Oral health outcomes

Sources	Developing toothbrushing habits	Reducing dental fear	Teaching healthy eating habits	Overall rating
Media (TV/Radio)	4.2	4.4	4.1	4.23
Family dentist/hygienist	2.2	2.4	3.4	2.67
Dental health carnival (at College of Dentistry)	2.8	2.4	2.8	2.67
School	3.5	3.7	2.6	3.27
Parents/Siblings	1.8	1.7	1.5	1.67

### Rating Scale:

- 5 = Very successful
- 4 = Successful
- 3 = Uncertain/Not sure
- 2 = Unsuccessful
- 1 = Very unsuccessful

flossing and nutrition/eating/snacking habits of the children. Toothbrushing received an average of 1.2; flossing, 0.7; and nutrition/eating/snacking, 0.9. This shows enhanced oral health in each of these areas.

Respondents ranked the five most common sources for teaching oral hygiene skills (toothbrushing), reducing



dental fear, and teaching healthy eating habits. Table 3 presents these results. The lower the number, the higher the success of these sources. Parents/siblings were viewed as the most successful source in all three areas. Media (TV/radio) was judged the least successful. Overall, the dental carnival received a 2.67 ranking for the three areas, the exact ranking of family dentist/hygienist.

Respondents were also asked to rate on a four-point scale (1 = not afraid, 2 = a little afraid, 3 = afraid, to 4 = very afraid) how fearful the children were of going to the dentist before and after attending the carnival. The average rating before attending was 1.78; after attending, 1.31. A paired t-test of these means showed significant reduction in fear ( $p = \text{less than } .0001$ ,  $t = 8.19$ ).

### Overall success of carnival

Respondents were asked to rate the overall success of the carnival with all things considered (education, atmosphere and fun) using a five-point scale (same rating scale as Table 1) with 1 = very unsuccessful to 5 = very successful. A 4.6 rating was achieved and 97.6 percent stated they would recommend the carnival to others.

## DISCUSSION

The authors have maintained that a Children's Dental Health Carnival is a very effective vehicle, if not the most effective vehicle, to educate children concerning dental health.

The authors consider the 54.7 percent response rate as favorable considering the lengthy written answers as well as many multi-part questions sought on the questionnaire.

Table 1 presents data concerning the carnival events that provide both educational as well as entertainment components. All were considered more than "successful" in entertainment with the exception of the "Dinosaur Adventure." This was the only event that was planned and run by a dental group outside the College of Dentistry. Three of the events were considered less than "successful" in the educational category. The limited success of the "Dinosaur Adventure" was anticipated due to outside coordination and the passivity of the event. It was surprising, however, that the "Tooth Fairy" was rated so low. When considering the age breakdown, young children liked the "Tooth Fairy" while older children did not frequent the "Tooth Fairy." The parents of the latter group would have thus marked the questionnaire "uncertain/not sure", lowering the

overall score. The "Count Plaqla" and "Strep Mutans" costumed characters were also extremely successful overall. Some smaller children were frightened of the Count Dracula-type costumes and they received a lower score from their parents/guardians.

Dr. Sluggo is a caped character known as the "Superman of Dentistry." He puts on a ten to fifteen-minute show that included a "rap" song about brushing and flossing teeth. One parent commented that the week following the carnival, her three-year-old daughter was walking around saying "brush your teeth-tss-tss-tss, I say, floss your teeth-tss-tss-tss" and telling her dolls about it. Another parent stated her daughter's favorite event was Dr. Sluggo and that she is always singing one of Dr. Sluggo's tunes — "It's cool to brush your teeth! I say it's COOOOL to brush your teeth."

The carnival included at least eight different events that educate children about oral health. There are approximately five other events that cater more to educating the parents/guardians than the children. When the parents/guardians were asked to rate the educational experience of certain events for themselves, most responses were between "successful" and "very successful", with the exception of one event "tooth development." The lower score was thought to involve the inherently more difficult subject matter of the booth. When the parents responded for the educational experience of their children, the same type of events "process of tooth decay" and "knowledge of teeth" received the lowest scores. Again these areas would be teaching the most complex material. Overall, the parents/guardians gave a 3.3 (between "above average" and "outstanding") rating for the educational experience of the carnival.

Table 2 rates the entertainment quality of eight events which are geared to entertain with little or no educational component. At each one of the these eight events, a child received a small toy (prize) as a reward for playing the game regardless of performance in the game. It is very clear that these prizes are very enjoyable as they received the highest score. The activity level of the eight games was correlated positively with enjoyment ratings. If the game was filled with a lot of action, it received a high score. The more passive games received a lower entertainment rating.

One of the most important goals of the carnival was to improve children's toothbrushing, flossing and eating habits. Each child received a new toothbrush and tube of toothpaste. The carnival worker (dental or dental hygiene student, hygienist or dentist) demonstrated the proper method of toothbrushing, then removed the new toothbrush from its box and handed it to the child to



demonstrate what she was just shown.

Parents/guardians rated "toothbrushing" as the number 1 area of improvement resulting from the carnival. One parent remarked that her daughter is now a "brushaholic"—"she likes her own toothbrush." One grandmother noted "toothbrushing has really become important since my two grandchildren both have their own brush and small tube of toothpaste at grandma's house. It gave me the idea to purchase sample size toothpaste for them and it is the right size for their little hands."

Improvement in flossing was less noticeable. A brief description of the flossing instruction at the carnival helps to account, however, for this. The carnival event for teaching flossing skills featured large plaster models of three teeth, with magnetic strips in the interproximal area. To these magnetic strips were stuck several small velcro pieces simulating plaque ("the tooth bugs"). Children were handed a big (12") toothbrush and asked to brush off the "tooth bugs." When this failed, a ten to twelve-inch piece of yarn was given to the children to simulate the floss. They were then instructed how to "floss" to remove the "tooth bugs." This event targeted children eight years and older since this is the approximate age that children can be expected to learn to floss.<sup>3-5</sup> It is not surprising, therefore, that flossing improvement received lower overall ratings, especially since the respondents who brought more than one child gave an overall rating across all ages. Furthermore, less time was spent with younger children, due to their still developing motor skills; although younger children enjoyed the event as a game. As one parent commented, "My child best remembers the flossing demonstration and how to get those 'tooth bugs' out of his teeth. This was a new concept and he now attempts it semiregularly." Another parent stated "the flossing booth was exactly what we needed — my oldest came home and started using her floss as we had not started our children yet on flossing."

"Some improvement" in nutrition was also observed. Nutrition was emphasized at two different educational booths and also at the refreshment booth. Only snacks with some health overtones were served: 2 percent milk, 100 percent orange juice, carrot sticks, celery sticks, cheese cubes, and popcorn. In addition the local dairy council donated many nutrition posters, which were used for decoration along the carnival route. At the conclusion of the carnival, many adults asked whether they could take a nutrition poster.

Table 3 summarizes adults' perceptions of the effectiveness of various sources:

- ☐ Develop toothbrushing skills.
- ☐ Reduce dental fear.
- ☐ Teach healthy eating habits.

As might be expected parents viewed the family (parents/siblings) as the most effective source to help children in all three areas. This perception seems consistent with the literature pertaining to the development of

sound oral health habits in children.<sup>3,4-6</sup> The media (TV/radio) was ranked as the least successful source, followed by school. Significantly, the Dental Health Carnival and the family dentist/hygienist tied for the second most successful source, with an overall ranking of 2.67 for all three areas. Results also showed a significant reduction in the level of fear of going to the dentist as a result of attending the dental carnival. One parent commented "I think carnivals like this make the parents' job easier when it comes to taking their children to the dentist." Another parent noted that her daughter was frightened of the dentist, hygienist, and dental chairs but "now after attending several years of the carnival she jumps right up in the chair with ease"!

The respondents rated highly the overall success of the carnival after considering all aspects; fun education and atmosphere, with a 4.6 average (4 being successful and 5 being very successful. Some concluding parent comments: "Very enjoyable and education - Thanks"; "I thought it was a wonderful experience"; "I think it's a great and fun way to teach kids about dental health"; "I cannot express how strongly this was a positive event in my boys' life — it was wonderful, educational and fun; a real reinforcement to what my husband and I have been drilling into their heads all of their five and six years of life, thank you."

Altogether, the results, particularly those pertaining to the effectiveness in teaching toothbrushing, in reducing dental fear and improving eating habits, support the authors' belief that the dental carnival is an effective vehicle to educate children about sound oral health. A dental health carnival can be, and in this case is, an integral member of the dental professional team, instructing children in a festive atmosphere with positive influence similar in some ways to that of the family dentist/hygienist. We recommend that all dental organizations, community and state, and all dental colleges initiate a Children's Dental Health Carnival.

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# DEMOGRAPHICS

## Mid-1990s profile of U.S. children and the conditions in which they live

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

On January 1, 1995 there were 261,638,000 people in the United States—an increase of 13 million persons since the 1990 census. Sixty-eight million (26 percent) were less than eighteen years of age (19.7 million were less than five years, 3.9 million were five to thirteen years, and 13.9 million were fourteen to seventeen years). This was an increase of almost four million youngsters since 1990. In 1994, there were 3.9 million births. This marked the first time since 1989 that the number of births had not reached the four million mark.\*

During 1994, the Hispanic (may be of any race) population grew by 0.9 million people (an increase of 3.5 percent). At the same time, the white non-Hispanic population added 0.8 million people (an increase of 0.4 percent). This was the first time that the yearly growth in the Hispanic population was numerically larger than the growth in the white non-Hispanic population. During the same period the Asian and Pacific Islander population grew by 0.3 million (an increase of 3.2 percent), the African-American population grew by 0.5 million (an increase of 1.5 percent) and the native American population grew by 33 thousand (an increase of 1.5 percent).

The increasing numbers and diversity of the youngsters and their living conditions in our communities de-

mand a particular awareness by health practitioners. The Bureau of the Census mid-decade report offers an opportunity to review the evolving characteristics of the patients that are (or will be) served by pediatric dentists.

### IMMIGRATION

The increase in population numbers is a reflection of both natural increases in the residential population and international immigration. In the 1990s, the average annual number of immigrants has been 759,000 persons—with particularly greater increases in the rate of Asian and Pacific Islanders, and Hispanic origin populations (Figure 1). The impact of these changes is reflected in the pupil composition of one Newcomer school in New York City and the more than two dozen different native languages spoken by the immigrant students (Table).

Note: fertility rates of foreign-born women is higher than native-born women. Among foreign women, those born in Mexico had the highest fertility rates (147 births per 1,000 women) compared with 53 births per 1,000 women born in Europe and 58 births per 1,000 women born in Asia.

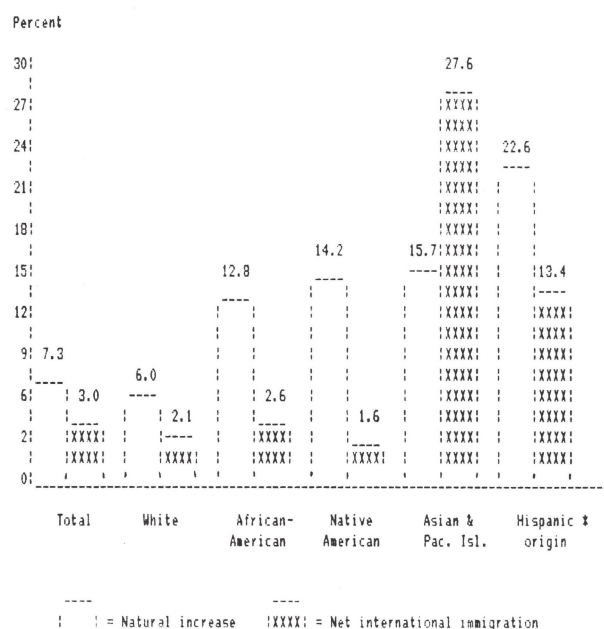
### CONTINUED POPULATION DIVERSITY IN THE MID-1990S

The white non-Hispanic population represents approximately 73 percent of the total population (down from 75.7 percent in 1990). By the turn of the century, the proportional representation of this population will de-

\*Unless otherwise specified, all data for this presentation were drawn from the extensive Bureau of Census report, "Population Profile of the United States: 1995."<sup>1</sup>

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\* May be of any race

Figure 1. Average annual rates of natural increase and net international migration, by race and Hispanic origin: 1990-1994.<sup>1</sup>

Table 1. Native languages spoken by students in Newcomer school in one New York City community: 1995.<sup>2</sup>

Albanian	Hungarian
Arabic	Indonesian
Bengali	Korean
Belarussian	Pashto (Afghanistan)
Bulgarian	Polish
Burmese	Portuguese
Chinese (including Cantonese)	Punjabi
Fujianese, Mandarin	Romanian
Shanghainese)	Spanish
Tagalog (Philippine Islands)	Tamil
French	Thai
Greek	Turkish
Haitian Creole	Ukrainian
Hindi	Urdu

crease to 71.6 percent (with a continued decrease to 62 percent by 2025).

The African-American population represents 12.5 percent of the total population. It will increase to 14.2 percent by 2025.

The Asian and Pacific Islander population represents 4.0 percent of the total population. It will increase to 7.5 percent by 2025.

The Hispanic population represents 9.0 percent of the population. By 2000, the Hispanic population may increase to 31 million. The projections for this population are for a doubling of its 1990 size by 2015. It will increase to 16.8 percent of the population by 2025—surpassing the African-American population as the most numerous minority group.

## UNEVEN STATE POPULATION TRENDS

Keeping track of the changing numbers of youngsters in our communities is increasingly more complex as the shifts in population between states change during the mid-1990s. For example:

- ☐ During the 1980s, California was the fifth fastest growing state in the nation, but dropped to nineteenth during the 1990s. Its population continues to grow, but the rate of growth has declined each year in the 1990s—dropping below the national average during the mid-1990s. The state has experienced increased outmigration since 1990. Between 1993-94, 426,000 persons migrated to other states.
- ☐ Seven of the nation's ten fastest growing states were Rocky Mountain states. Nevada led all other states in the rate of growth, followed by Arizona.
- ☐ In the South, the states of Texas, Florida and Georgia ranked nationally first, second and fourth, respectively, in the amount of population growth.
- ☐ The Northeast and Midwest registered modest growth during the 1990s. Connecticut and Rhode Island experienced decreases in population during the mid-1990s.

In the future, there will be dramatic population increases in California (more than 16 million persons), Texas and Florida (Figure 2).

## GEOGRAPHIC MOBILITY

About one in six persons move each year. Between 1992 and 1993, 42 million persons moved from one residence to another. Most of these persons (26 million) moved within the same county. The moves included 22.6 percent of children one to four years of age, 17.1 percent children five to nine years of age, and 13.9 percent of children between ten to fourteen years of age.

- ☐ The highest mobility rates were for young adults in their early twenties (approximately one-third moved).
- ☐ Whites moved less often than African-Americans and Hispanics.
- ☐ Renters moved more often than homeowners.



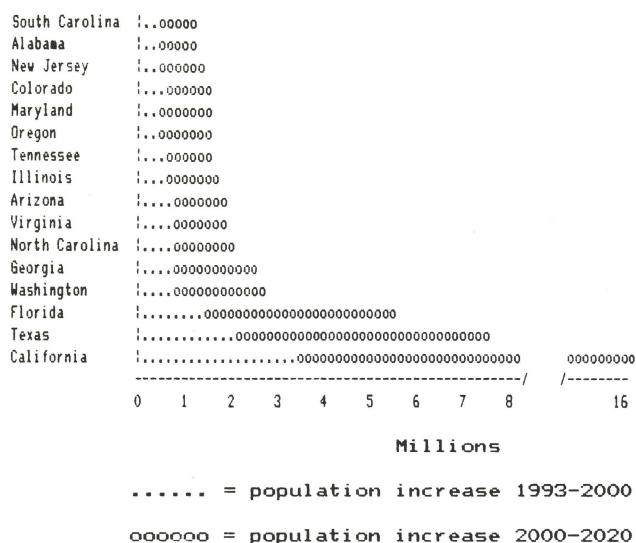


Figure 2. Net population change for states gaining at least 1 million persons: 1993-2020.<sup>1</sup>

## SINGLE PARENT FAMILIES

Families do not necessarily include children. The most recent year in which the majority of families included at least one child among their members was 1982. In 1994, married couples with children represented only one family in four (25.8 percent) of all households (compared to 40.3 percent in 1970).

The number of single parent families increased from 3.8 million in 1970, to 6.9 million in 1980, to 11.4 million in 1994. The number has been increasing by an average of 3.9 percent per year since 1990—a rate not significantly different from that for the 1980s.

About 38 percent of women fifteen to forty-four years of age in 1994 had never married. Of these 22.7 million women, 20 percent had given birth to at least one child at the time of the survey. About 7 percent of never married teenagers had borne a child. Among women in their thirties, about 40 percent had borne a child out-of-wedlock. Approximately one half of never-married African-American women had a baby, compared to one in four never-married Hispanic women and one in eight never-married white women. In 1994, 26 percent of all births were born out of wedlock.

Children living with one parent (18.6 million) represented 27 percent of all children less than eighteen years of age—an increase from 12 percent in 1970. Of the children who lived with one parent, the proportion who

lived with a parent who had never married increased by one half since the mid-1980s (from 24 percent to 36 percent).

About 7.3 million or 64 percent of all single parents in 1994 were white, but the incidence of one-parent families is much greater among African-Americans than whites. Single parents accounted for almost two-thirds (65 percent) of all African-American families with children present, compared with 25 percent among whites.

Mothers account for the vast majority of single parents in 1994 (9.9 million single mothers vs. 1.6 million single fathers). About 38 percent of single parents have never married (about equal to the percent who were divorced).

## WOMEN IN THE LABOR FORCE

In 1994, 53 percent of women fifteen to forty-four years of age who had a child in the preceding twelve months were in the labor force.

Among mothers with newborn children, 70 percent of mothers who had at least a bachelor's degree were in the labor force, compared to 48 percent who had completed only high school and 34 percent with less than a high school education.

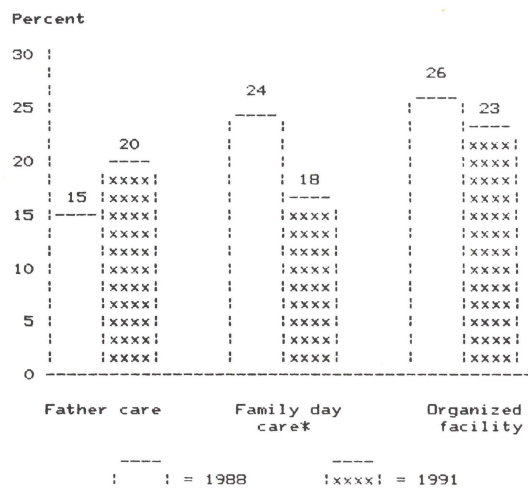
## CHILD CARE ARRANGEMENTS

In the early 1990s, 9.9 million children less than five years of age were in need of care, while their mothers were at work. About two-thirds of preschool children were cared for in either their own home (36 percent) or another home (31 percent) for the majority of time their mothers were away at work. Most of the children cared for in their own homes were taken care of by their fathers.

In the past two decades, enrollment in nursery school more than doubled from 1.2 million to 2.7 million three to four year old children. More recently in the 1990s, however, the proportion of children cared for by family day care providers (nonrelatives in the provider's home) and organized child care facilities declined (Figure 3). These declines may reflect 1) the desires of parents to reduce child care costs and move to more parental supervision of their children whenever possible, or 2) increased difficulties in securing licensed family care providers.

For many families, child care is a costly expense. Poor families spent a larger percent of their family income on child care (20 percent) than similar nonpoor families (8 percent).





\* Nonrelative providers caring for child in provider's home

Figure 3. Selected child care arrangements for employed mothers: 1988, 1991.<sup>1</sup>

## CHILD SUPPORT

In 1992, 6.2 million men and women had awards for child support from parents who were absent from the household. Of those women due payments, 76 percent actually received some payments (all or partial). The receipt rate for custodial fathers was 63 percent. \$5.8 billion (one-third of child support awarded by the courts or by common agreement) was not received by the custodial parents. (Note: by the late 1980s, the annual number of children involved in new divorces passed the one million mark.<sup>4</sup>)

- More than one-third of custodial mothers (35.4 percent) and 13.1 percent of custodial fathers had incomes below the poverty level. The poverty rate for white custodial women was 28 percent. For African-American custodial women it was 53 percent; 54 percent for Hispanic custodial women.<sup>3</sup>
- Paying child support was more common among noncustodial parents that had provisions to make contact with their children than noncustodial parents who had no contact provisions (79 percent vs 56 percent).<sup>3</sup>
- Of the parents awarded child support payment, 41 percent had health insurance benefits included in their awards. (Note: 13.7 percent of all children less than eighteen years of age had no health insurance coverage.)

- The average child support received by custodial mothers receiving all or some payments in 1991 was \$3,011, compared to \$2,292 received by custodial fathers.<sup>3</sup>

## CHILD ABUSE AND NEGLECT

In the 1990s, annually, almost one million children are victims of abuse and neglect (51.7 percent of the cases are for neglect, 23.1 percent for physical abuse and 14.2 percent for sexual abuse).

- 55.2 percent of the victims are white, 25.8 percent are African-Americans, 9.5 percent are Hispanic\*\* and 1.4 percent are Native Americans.
- 13.4 percent of the victims are age one year or less, 26.4 percent are two to five years, 23.3 percent and six to nine years.<sup>4</sup>

## POVERTY

Half of the nation's poor in 1993 were either children under eighteen years (40.1 percent) or persons 65 years old and over (9.6 percent). The poverty rate for children was 22.7 percent, higher than that of any other age-group. (The proportion of the elderly living in poverty was 12.2 percent.)

- 16.9 percent (8.9 million) of white children, 46.6 percent (4.9 million) of African-American children and 39.9 percent (3.1 million) of Hispanic children live in poverty.
- 24 percent (5.6 million) of children less than six years of age live in poverty; including 2.3 million white non-Hispanic children, 1.8 million African-American and 1.3 million Hispanic children.<sup>4</sup>
- 35.6 percent of families headed by women with no spouse present were poor. The proportion of female householder families in poverty was substantially higher for African-American (49.9 percent) and Hispanics (51.6 percent) than for whites (29.2 percent).

Children represent 26 percent of the population, but 42 percent of the participants in public assistance programs (including AFDC, SSI, food stamps, public or subsidized housing, Medicaid, etc.). In the early 1990s, 24 percent of children less than eighteen years of age were involved in assistance programs in one or more months of a cal-

\*\*Some states do not report the number of Hispanic victims. Thus nationwide findings would be an understatement of the actual number of cases.



endar year. The median monthly family benefit received by children amounted to \$528.

## MINORITY POPULATIONS

### Hispanics

In 1994, the estimated Hispanic population in the U.S. was 27 million persons or approximately one out of ten persons in the population. Nearly two of every three Hispanics are of Mexican origin. 29.6 percent of Hispanics were under fifteen years of age, compared to 20.4 percent of non-Hispanic whites.<sup>5</sup>

- ☐ Over one-third (39 percent) of Hispanics were born outside of the United States (compared to 3 percent of the non-Hispanic white population).<sup>5</sup>
- ☐ Despite marked improvements in the educational attainment of Hispanics, the proportion with less than a fifth-grade education (11.8 percent) in 1993 was more than fourteen times greater than that of non-Hispanic whites (0.8 percent).
- ☐ Hispanics are much more likely to be unemployed (11.9 percent in 1994—ranging from 7 percent for Cubans to 14 percent for Puerto Ricans) compared to non-Hispanic whites (6 percent).<sup>5</sup>
- ☐ Median incomes for year-round, full-time employed Hispanic males are one-third less than that for non-Hispanic white males.
- ☐ Eighteen percent of the persons living in poverty were of Hispanic origin.
- ☐ Twenty-seven percent of Hispanic families (ranging from 17 percent of Cuban families to 35 percent of Puerto Rican families), compared to 11 percent of non-Hispanic families were poor.<sup>5</sup>
- ☐ Two of every five Hispanic children are living in poverty, compared to 13.2 percent of non-Hispanic white children. Hispanic children represent 11.7 percent of all U.S. children, but were 21.3 percent of all children living in poverty in the early 1990s.
- ☐ Fifty percent of the Hispanic population experienced a lapse in health insurance coverage between 1991 and 1993, compared to 36 percent of African-Americans and 22 percent of non-Hispanic whites.<sup>6</sup>

### African-Americans

In 1994 the African-American population was estimated at 33.0 million persons (or 12.7 percent of the total population), including 11 million children.

- ☐ Less than one-half (47 percent) of all African-

American families were married couples. Sixty-four percent of African-American children (compared to 21 percent of non-Hispanic white children) lived in single parent families.<sup>7</sup>

- ☐ Fewer African-Americans are dropping out of high school. In 1993, there was no statistical difference in the annual high school dropout rates of African-Americans and whites, and males and females.
- ☐ The unemployment rate in 1994 for African-Americans (11 percent) was more than twice the rate for whites (5 percent).
- ☐ Among those with high school diplomas, African-American men earned 73 percent of the amount earned by their non-Hispanic white counterparts.
- ☐ In 1993, one-third of all African-Americans were poor. Nearly half (46 percent) of all poor African-Americans were children.

### Asian and Pacific Islanders

In 1994, the Asian and Pacific Islander population was estimated at 8.8 million. This population is a heterogeneous group—differing in language, culture and recency of immigration.

- ☐ The majority (six out of ten persons) reside in the West where they represent 8 percent of the population. They are more likely than non-Hispanic whites to reside in metropolitan areas (95 percent vs 75 percent).
- ☐ Asians and Pacific Islanders continue to have high educational attainment. In 1994, two-fifths who were twenty-five years and older held at least one college degree.
- ☐ In 1993, Asian and Pacific Islanders families had slightly higher median family incomes than non-Hispanic white families (\$44 thousand vs \$41 thousand).
- ☐ Despite higher educational attainments and comparable median family incomes, the poverty rate for Asian and Pacific Islander families (14 percent) was higher than that of non-Hispanic white families (8 percent).

### Native Americans

In 1994, the Native American population (American Indians, Eskimos, and Aleut populations) numbered approximately 2.2 million persons. Nearly half of the Native Americans lived west of the Mississippi River. In 1990, 39 percent of the Native American population was under twenty years of age (compared with 29 percent of the nation's total population).



- ☐ In 1989, 31 percent of Native Americans lived below the poverty level (compared to 13 percent of the general population).
- ☐ Native Americans on reservations and trust lands had lower per capita incomes compared to all Native Americans (\$4,500 vs \$8,300).

### FROM THE PRACTITIONER'S PERSPECTIVE

Managed care (more correctly, "managed economics") has become the lightning rod for practitioner concern in the second half of this decade. While the emphasis on bottom-line factors is critical, as health providers we must not lose sight of the evolving character of our young patients and the circumstances in which they are being reared.

For many, our training and experiences may not have prepared us for the changes in languages, customs, cultures, and family structure that now provide the developmental environment for the youngsters seen in dental practices in the mid-1990s. But even an awareness of these "traditional" demographic changes would not complete our comprehension of the events impacting on the lives of our younger patients. For example, based upon our own experiences, how many of us would have thought that:

- ☐ Almost half (46 percent) of the deaths of youngsters one to fourteen years of age would be from accidents and homicides?<sup>8</sup>
- ☐ A city council would find it necessary to approve a law "...making it illegal for students to carry box

cutters and ban their sale to anyone under eighteen years of age."<sup>9</sup>

If we are to provide services to the youngsters in our communities, then we must increase our awareness of their world beyond the confines of our practices. Some of us might even find out what is a "box cutter," why children find it necessary to carry them, and understand why 2,250 of these razor blades were seized last year in one school system!

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### DECIDUOUS ENAMEL DEFECTS AS PREDICTORS

This study has shown that children with diffuse defects affecting the deciduous molars are more likely to have defects on their permanent incisors than are those children who do not have such defects in the deciduous dentition. Interpretation of the results, however, was complicated by the various numbers of missing teeth with which the individual children presented. A child had a greater likelihood of being classified as "having diffuse defects" the more teeth were present. This problem was addressed first by analysis of the data for all children and then repetition of the analysis with the exclusion of those children with missing teeth in either their deciduous or permanent dentitions. This secondary analysis reinforced the main finding of the study.

Milsom, K.M. *et al*: Enamel defects in the deciduous dentition as a potential predictor of defects in the permanent dentition of 8- and 9-year-old children . . .

J Dent Res, 75:1015-1018, April 1996.

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# Uninsured children and adults

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

“Contrary to popular myth, the uninsured are not all poor, elderly, or otherwise vulnerable.”<sup>1</sup>

Third party health insurance coverage may be an increasing reality for hospital costs (representing 96.6 percent of costs) and physician costs (representing 81.9 percent of costs), but in the early 1990s, more than half (53.6 percent) of the costs for dental services continued to be paid by patients on an out-of-pocket basis.<sup>2</sup> In 1992,

- Dental practitioners reported that almost one-third (32.2 percent) of their patients had no form of dental insurance (either private or public assistance) (Table 1).
- Thirty-nine million people were without health insurance at any given time. Over the course of the year, “...as many as 53 million Americans may (have been) without insurance for a month or more. But as few as 22 million people may (have been) uninsured for the entire year.”<sup>4</sup>
- Eight million three hundred thousand children less than 18 years of age were not covered by health insurance (i.e. did not have Medicare, Medicaid, private insurance, or other forms of insurance) (Table 2).

Previous reviews in the *Journal of Dentistry for Chil-*

Table 1 □ Percent of patients by source of payment for dental services: 1992.<sup>3</sup>

	General practitioners	Specialists	Total
Private insurance	62.6%	60.9%	62.3%
Public assistance	5.3	5.6	5.4
No insurance	31.9	33.4	32.2

dren reported the increasing use of preventive and general dental services by children and adults related to the availability of third-party payments.<sup>5</sup> Fifteen percent of all children less than 18 years of age had no general health insurance coverage. Children who are nonwhite residents of the South and West regions of the nation and central cities in metropolitan statistical areas had less coverage than their respective counterparts.<sup>6</sup> Results from the 1989 national survey of the use of dental services, once again linked insurance and high family income with a greater use of dental services by children.<sup>7</sup>

As this material is being prepared in the fall of 1994, there continues to be increased political attention to the lack of health insurance (and its consequences) for the tens of millions of children and adults in our communities. For the busy practitioner, the need is to categorize (i.e. simplify) the virtual avalanche of confusing demographics and rhetoric on who does and does not

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\*See a previous presentation in the *Journal of Dentistry for Children* for a more detailed presentation on particular health insurance coverage for children.<sup>6</sup>



Table 2 □ Number of uninsured by state: 1992.<sup>1</sup>

	Total number of uninsured adults and children	Uninsured in working families	Number of uninsured children
	(in 000s)	Percent	(in 000s)
Alabama	694	79.3%	177
Alaska	84	90.5	16
Arizona	541	90.2	117
Arkansas	479	86.8	158
California	5,937	85.1	1,319
Colorado	412	83.3	81
Connecticut	255	80.8	44
Delaware	79	91.1	16
Dist. of Col.	108	76.9	16
Florida	2,656	87.5	591
Georgia	1,222	83.1	338
Hawaii	70	81.4	14
Idaho	172	86.6	53
Illinois	1,536	80.2	331
Indiana	609	87.4	121
Iowa	294	93.9	69
Kansas	269	91.4	61
Kentucky	532	73.1	129
Louisiana	932	77.7	233
Maine	141	88.7	31
Maryland	544	84.7	78
Massachusetts	601	81.7	137
Michigan	922	80.0	189
Minnesota	347	90.5	46
Mississippi	513	84.6	141
Missouri	724	83.8	175
Montana	77	88.3	12
Nebraska	147	91.8	38
Nevada	292	81.2	84
New Hampshire	145	87.6	31
New Jersey	997	83.4	192
New Mexico	297	83.8	77
New York	2,352	80.1	463
North Carolina	917	84.1	204
North Dakota	51	90.2	9
Ohio	1,218	82.6	279
Oklahoma	701	87.3	198
Oregon	393	88.3	65
Pennsylvania	1,038	76.9	200
Rhode Island	89	79.8	15
South Carolina	615	80.8	113
South Dakota	106	86.8	33
Tennessee	681	81.2	133
Texas	3,839	84.2	972
Utah	204	90.2	65
Vermont	56	87.5	6
Virginia	889	83.2	150
Washington	505	91.3	122
West Virginia	271	76.4	61
Wisconsin	457	89.1	119
Wyoming	56	91.1	16
Total	37,066	83.8%	8,335

have some form of health insurance coverage). It is to this end that the following short summary of available information (for the early 1990s) from various governmental and private agencies is provided.

## WHO ARE THE UNINSURED?

### By age

Almost one quarter of all children less than 18 years of age do not have health insurance coverage. Approxi-

mately one half of the uninsured are less than thirty years of age. Virtually all persons sixty-five years and over are covered under the Medicare program (Table 3).

### By race and ethnicity

Hispanics (who may be of any race) are more likely than African-Americans to experience a loss or lapse of coverage. Between 1990 and 1992, 48 percent of Hispanics, 36 percent of African-Americans and 24 percent of whites were uninsured for a month or more.<sup>8</sup>

### By gender

Women are slightly less likely than men to have had gaps in coverage, because 1) it is more common for women to be poor and to participate in Medicaid and 2) a greater proportion of women than men are sixty-five years and over and enrolled, therefore, in Medicare.<sup>8</sup>

### By employment status

Eighty-four percent of the uninsured come from families headed by individuals who work at least part of the year. More than half (52.2 percent) of the individuals with no health insurance live in families where at least one spouse is a full-year, full-time worker. In addition,

- Twenty-five percent are in families with a part-year, part-time worker.
- Six and six-tenths percent are in families with a full-year, part-time worker.
- Sixteen and six-tenths percent are in families with nonworkers.<sup>1</sup>
- Of the 31.1 million uninsured people (including 8.3 million children and 22.8 million adults) 83.8 percent live in working families (Table 2).

### By employment and income

Almost 90 percent of individuals receive their health insurance through employment arrangements.<sup>1</sup> However, "...a major reason for the (recent) ... increase in the number of uninsured is a decline in coverage among people working for small firms."<sup>4</sup> Nine million eight hundred thousand persons, or 30 percent of the total number of people in families headed by those who work for firms with less than ten employees are uninsured. The proportion without insurance coverage decreases with employment in larger size businesses (reaching 10 percent in firms with one thousand or more employees (Table 4).



Table 3 □ Percent uninsured by age: 1992.<sup>1</sup>

Age	Uninsured
<18 yrs	22.5%
18-24 yrs	19.0%
25-29 yrs	12.4%
30-44 yrs	28.0%
45-54 yrs	10.8%
55-64 yrs	7.4%
65+ yrs	Near universal coverage of population by Medicare

Table 4 □ Number and percent of employees of each size firm who are uninsured: 1992.<sup>4</sup>

Firm size (employees)	Number insured (in millions)	Percent insured
Less than 10	9.8	30%
10-24	4.4	27
25-99	5.5	21
100-499	4.2	14
500-999	1.3	11
1,000+	7.2	10
Nonworkers	6.0	23

Note: Number and percent insured include employees and their dependents

Table 5 □ Percent uninsured by family income: 1992.<sup>1</sup>

Family income	Uninsured
<\$10,000	22.4%
\$10,000-\$19,999	27.7
\$20,000-\$29,999	18.9
\$30,000-\$49,999	17.9
\$50,000+	13.0

Table 6 □ Percent of uninsured by length of time without coverage: 1992.<sup>1</sup>

Months	Percent
1-4	3.5%
5-8	11.6
9-12	9.8
13-16	8.1
17-24	13.0
25+	53.9

Table 7 □ Decreasing percent of the population less than 65 years with no health insurance by state: 1992.<sup>10</sup>

State	Percent	State	Percent
Nevada	26.6%	Oregon	15.5%
Oklahoma	25.8	Illinois	15.3
Louisiana	25.7	New Jersey	15.3
Texas	25.7	New Hampshire	14.8
Dist. of Col.	25.5	Colorado	14.6
Florida	24.2	Maryland	14.0
Arkansas	23.5	Wyoming	13.8
Mississippi	22.7	Delaware	13.4
New Mexico	22.5	Maine	13.1
Georgia	22.4	Ohio	13.0
California	22.2	Utah	13.0
South Carolina	20.8	Kansas	12.6
Alabama	20.1	Indiana	12.6
Alaska	19.3	Washington	12.4
Idaho	19.0	Massachusetts	12.4
West Virginia	18.5	Montana	12.3
South Dakota	18.5	Michigan	11.9
Arizona	18.5	Iowa	11.7
UNITED STATES	17.4	Nebraska	11.3
Virginia	17.4	Rhode Island	11.1
Kentucky	17.1	Vermont	11.1
Missouri	16.6	Pennsylvania	10.7
North Carolina	16.4	North Dakota	10.5
New York	16.1	Wisconsin	10.5
Tennessee	16.0	Minnesota	10.0
		Connecticut	9.6
		Hawaii	8.1

- During the 1990s, there has been a gradual decline in the number of people with private health insurance coverage and in the number securing coverage through employment.<sup>4</sup>
- Because small businesses and the self-employment have difficulty in obtaining affordable insurance, almost one-third of the uninsured are in families with an income of \$30,000 or more.<sup>1</sup>
- Seventy-two percent of the uninsured are in families that are above the poverty line.
- Twenty-two percent of uninsured individuals are in a family with an annual income of less than \$10,000.
- More than one quarter of uninsured individuals are in a family with an annual income of between \$10,000 and \$19,999 (Table 5).

(Note: Medicaid coverage is provided to 50 percent of those in poverty and 25 percent of those above the poverty line.<sup>1</sup>)

### Length of time without coverage

Between 1990 and 1992, "60 million Americans, or a quarter of the populations outside of institutions like prisons and nursing homes, lacked coverage for at least one month."<sup>8</sup> Young adults are the most vulnerable to lapses in coverage. During this same period, one half of the people between ages eighteen and twenty-four spent at least one month without coverage, compared with just 1 percent of the elderly, most of whom are covered by Medicare.<sup>8</sup>

Based on past experiences, it is estimated that 75 percent of individuals who currently are uninsured will be



uninsured for one year; 54 percent will be uninsured for two years (Table 6).

### By residence

Between 1991 and 1993, the proportion of people with health insurance rose in three states, but declined in thirteen, with North Dakota and Oklahoma experiencing the greatest decreases.<sup>9</sup> In 1992,

- ☐ Ninety percent or more of the uninsured who resident in each of eleven states (Alaska, Arizona, Delaware, Iowa, Kansas, Minnesota, Nebraska, North Dakota, Utah, Washington, Wyoming) lived in working families (Table 2).
- ☐ There were more than 100,000 uninsured children in each of twenty-five states; 1.3 million uninsured children (15.6 percent of all uninsured children) lived in California (Table 2).
- ☐ Nationally, 17.4 percent of the people under sixty-five years were uninsured. At the state level, residents of the southern sunbelt states were less likely to have health insurance. The percent uninsured ranged from 26.6 percent, 25.8 percent, and 25.7 percent, respectively, in Nevada, Oklahoma, and Louisiana to 10.0 percent, 9.6 percent, and 8.1 percent, respectively, in Minnesota, Connecticut, and Hawaii (Table 7).

### PRIVATE HEALTH INSURANCE AND PUBLIC ASSISTANCE

Almost three quarters of all children (72 percent) had private health care coverage in 1989. White children had the highest percent of private coverage (76 percent), African-American children the lowest (51 percent). Children residing in the Northeast, Midwest, and noncentral city areas of metropolitan statistical areas had the highest rate of private coverage.

Eleven percent of children had public assistance coverage (primarily Medicaid). Public assistance coverage was higher for 1) persons who are nonwhite, 2) those with low incomes, and 3) residents of central cities in metropolitan statistical areas.\*

### COMMENTARY

Managed Care, Gate Keepers, Closed Panels, Diagnosis Related Groups, Peer Review Organizations, Health Maintenance Organization, and Preferred Provider Organizations are but a few inclusions in the continuing expanding lexicon of the health care delivery vocabulary.

It is only in the last few years that the dental profession is faced by the intensity of changes that have had impact on the general medical profession for the past several decades. Undoubtedly, it is disturbing to the many dentists who entered the profession with far different expectations.

While we cannot halt the transformation of the system of health care, to some degree we may be able to guide its development to ensure the future of practices, the profession, and the patients that are served.

The underlying fact is that providing care to an expanding diversity of patients requires increased sources for financial resources. While one of the dental profession's basic concerns is to increase the support for its services, "The reality is that improving access to dental care is a function of improving the overall access to health care."<sup>6</sup>

Are we so certain of the future of the profession that we can ignore the fact that,

- ☐ Almost 40 million residents do not have health insurance coverage.
- ☐ More than one half of dental care costs continue to be paid out-of-pocket, while virtually all hospital costs and major components of physician services are covered by third-party programs.

Maybe its time we learned more about the uninsured children and adults in our communities!

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# Your next pediatric patient may not be getting needed child support payments

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

"In 1989, one in four unwed mothers had a child support order in place...even fewer received payments.<sup>1</sup>

"Only one half of the 4.8 million women owed child support received all they were entitled to."<sup>2</sup>

"As of 1989, more than \$18 billion in accumulated support, covering more than 16 million children, was still unpaid.<sup>3</sup>

In 1990, there were 20.6 million women who were separated or had been divorced from their husbands (17.2 million were white, 2.8 million were black and 1.5 million were Hispanic [may be of any race]). More than seven million of these women had one or more children in their households.

- ☐ In addition, 26 percent of all children are born to unwed mothers.
- ☐ Overall, the number of women living with children whose father was absent from the home reached almost ten million in the spring of 1990 (an appropriate increase of 39 percent in little more than a decade).
- ☐ About one quarter of all children (or 16 million children with absent fathers) lived in these households.<sup>4,5</sup>

It would be all but impossible for any pediatric dentist to maintain an active practice without providing services to numbers of children living in single parent house-

holds. It would be difficult to over-estimate the importance of the practitioner's awareness of, and attention to, the evolving realities of the child's family environment. Many of the personal problems faced by children in single parent and divorced parent households have been considered previously in the *Journal of Dentistry for Children*.<sup>6,7</sup> This presentation will further this review with emphasis on the altered economic realities that often accompany the dissolution of a marriage or the birth of a child to an unwed mother.

## CHILD SUPPORT AWARDS

In 1990, approximately 58 percent of the 10 million women with dependent children whose father was absent were awarded child support payments. Only about one half of the women due child support payments received, however, the full required amount. One quarter received partial payment and one quarter were receiving no support.<sup>4</sup>

While there have been decreases during the 1980s in the percent of women who did not receive child support, in 1990, more than one in five women above the poverty level and almost one third of women below the poverty level did not receive child payments (Table 1).

- ☐ About one third (32 percent) of all women with children from absent fathers were living in poverty.
- ☐ Health care benefits were included in the child support awards of 40 percent of mothers, but only two thirds of the absent fathers actually provided them.<sup>4</sup>

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Table 1 □ Child support payment from absent fathers for women with own children under 21 years of age: as of spring 1982 through spring 1990.<sup>4,5</sup>

	1982	1984	1986	1988	1990
	(Numbers in millions)				
Women above poverty level					
Supposed to receive payments	3.2	3.1	3.5	3.6	3.8
Received payments	2.4	2.5	2.6	2.8	2.9
Did not receive payments - Number	.8	.6	.9	.8	.9
- Percent	25.6%	19.8%	23.8%	22.4%	22.6%
Women below poverty level					
Supposed to receive payments	.8	.9	.9	1.2	1.2
Received payments	.5	.6	.6	.9	.8
Did not receive payments - Number	.3	.3	.3	.3	.4
- Percent	38.6%	38.0%	34.3%	28.1%	31.7%

Table 2 □ Support payments by selected demographic characteristics of females and absent males: 1989.<sup>4</sup>

	Supposed to receive child support (in millions)	Actually received support Percent	Child support as a percent of total income Percent
<b>Females</b>			
Race & Hispanic origin			
White	4.0	76.5%	18.8%
Black	.8	69.7	16.3
Hispanic*	.4	69.8	20.1
Years of school completed			
Less than 12 yrs	.7	66.7	21.4
High school: 4 yrs	2.5	76.4	19.9
College: 1-3 yrs	1.1	76.6	18.1
4 yrs +	.6	77.9	15.7
<b>Males</b>			
Visitation and custodial provisions of absent fathers			
Visitation privileges	3.9	79.1	18.2
Joint custody	.4	90.2	21.0
No visitation or custody	.7	44.5	17.9
Residence of absent father			
Same state as mother	3.4	81.1	18.4
Different state from mother	1.3	65.6	19.1
Other (including unknown)	.2	46.6	17.6

\* May be of any race

- Seventy-six percent of white females, compared to 70 percent of black and Hispanic females, actually received the child support to which they were entitled.
- A greater percent of females with twelve or more years of education received child support payments than their counterparts with less education.
- Fifty-five percent of fathers without visitation privileges or custody rights provided no child support.
- One third of fathers with residence in a different state from that of the mother provided no child support (Table 2).
- Child support payments were highest by fathers who were white, older, more educated, and higher household incomes, had not remarried, and had not other children to support.<sup>8</sup>

## ECONOMICS ASSOCIATED WITH SINGLE PARENTING

"Family income of children declined by nearly 40 percent within 4 months of parent's separation."<sup>9</sup>

After parental separation, the proportion of children living in poverty nearly doubled in the first four months (from 19 percent to 36 percent). The number of children in families receiving welfare doubled from 9 percent to 18 percent during the same period.<sup>9</sup>

In 1990, 54 percent of children on welfare had parents who never married. An additional 33 percent had parents who had divorced or were separated.<sup>10</sup> For ex-

ample, in the State of California, half of the 7.8 million children will live in a single parent household before reaching their eighteenth birthdays. Virtually all are entitled to support, but fewer than half and in some parts of the state only 20 percent receive the monies due them. "Absent parents, usually the fathers 'enjoy' a 40 percent rise in income after divorce... But children and parents (usually mothers) experience a 31 percent drop in income."<sup>11</sup>

## FINDING FATHERS

"States have started 'Most Wanted' lists".<sup>12</sup>

In 1990, almost 30 percent of the women with an absent father of their child(ren) had at some time contacted a government agency in an effort to locate the father, establish paternity, establishing support obligations, enforce a support order or obtain collection of funds.<sup>4</sup> Using the Federal Family Support Act of 1988, states have become aggressively involved in collecting court ordered child support. They collected \$6 billion in 1990.

The Child Support Enforcement program locates absent parents, establishes paternity of children born out-of-wedlock, and establishes and enforces support orders. By law, these services are available to all families that need them. The program is operated at the state and local government levels, but 68 percent of administrative costs are paid for by the federal government. Child support collected for families not receiving Aid to Families



with Dependent Children (AFDC) goes to the family to help maintain itself. Most of the child support funds collected on behalf of AFDC families goes to federal and state governments to offset AFDC payments. In 1989, 10.1 percent of AFDC payments were recovered (compared to 5.2 percent in 1980) through the Child Support Enforcement program.<sup>5</sup>

"Our current arrangement of having each of 50 states administer its own child support collection program—financed by federal tax dollars—is failing miserably."<sup>13</sup>

"(The child support system is) a cumbersome, slow-moving dinosaur fed by paper."<sup>14</sup>

More than 400,000 child support requests across state lines are made each year. Thirty percent of the cases involved in unpaid child support cases involve an out-of-state parent.<sup>3</sup> Failure of states to cooperate with each other has contributed, however, to the swelling of welfare roles.<sup>15</sup> One proposal has been to place the responsibility for collecting child support payments within the context of "salary withholding legislations" under the jurisdiction of the Internal Revenue Service.<sup>13</sup>

"Until robbing children is looked at the same way as robbing banks, nothing is going to change."<sup>16</sup>

By 1993, child support enforcement agencies spent \$2.2 billion to collect \$9.0 billion. \$3.98 was collected for every \$1 of administrative expense (compared to \$2.89 per dollar of administrative expenses in 1982). In addition, 553,000 paternities were established. Almost 4.5 million absent parents were located. More than a million support obligations were established and 12 percent of Aid to Families with Dependent Children (AFDC) payments were saved as a result of child support enforcement.<sup>17</sup>

## PEDIATRIC PRACTITIONER CONCERNS

The direct relationship between family higher incomes and the probability of the use of dental services has been reported repeatedly in the literature.<sup>18</sup> Consider then the potential consequences of a 31 percent decrease in child and parent income after a divorce (in the State of California) and the national average of almost a 40 percent decline in family income within 4 months of parent's separation.<sup>9,11</sup> Such a draconian change in the economics of a household would undermine the stability of most, if not all, families served by a dental practitioner.

(Note: while this presentation is emphasizing the economic consequences of withholding child support, we must not lose sight of the potentially severe emotional disruptive effects on the youngsters involved in the breakup of a marriage.)

Some of the consequences of parental separation, divorce and the failure to provide child support include,

- ☐ Reordering of family priorities (including health services).
- ☐ Failure to pay health insurance premiums (whether because of neglect or lack of needed funds) which may jeopardize the continuity of coverage and introduce a new set of waiting periods, deductibles and copayments.
- ☐ The need for modified payment arrangements, usually extended over longer periods of time.

Because the practitioner has other remedies (e.g. court action) legal requirements mandate that practitioners may not withhold services from children already under treatment because of the failure to maintain an agreed upon schedule of payments. For example, once begun, individual operative, and crown and bridge procedures would need to be completed. Once orthodontics procedures have commenced, the child's dentition would have to be placed in a stable position.

While child support funds may have vanished or at best are tied up in a maze of interstate litigations, there are remedies that may be pursued. Neglect of dental care for children qualifies for court action under the rubric of "child neglect." Necessary parental expenditures can be ordered by a court, or where parental funds are unavailable, social service agencies may be directed to provide needed support.

The quagmire of child support is not a problem of any particular economic or social group, or any particular racial and ethnic population. It is a problem that transcends all segments of the population. Have you considered the possibility that your next pediatric patient may (or soon will) not be receiving needed support payments? Are you prepared for such an eventuality?

## ADDENDUM

In 1995, New York State will join California, Maine and Massachusetts in suspending the driver's licenses of parents who fall more than four months behind in their child support payments. New York courts have ordered child-support payments in 380,000 cases. In 350,000 of those cases, (or 92 percent) parents are behind in payments. Parents owe more than \$1 billion. California has issued warnings to almost 23,000 drivers and has seen its child support collections increase by \$10 million. Massachusetts sent 60,000 warning notices last year and has collected \$600,000.<sup>19</sup>



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### NEED FOR A SUPPORT SYSTEM

The failure to build an effective support system will only magnify the destructive trends we see all about us. In 1960, before the first signs of family disintegration were noticed, fewer than 6 million American children lived in single-parent families. By 1990, that number nearly tripled to 16 million children. The number of children living with a never-married parent increased twentyfold during that period, from 243,000 children in 1960 to 4.9 million children in 1990.

During the 1980s, poverty rates for children climbed—from 16 percent in 1978 to 21 percent in 1990. As a result, America's child poverty rate was 10 times higher than in Sweden, seven times higher than in West Germany, and twice as high as in Canada and Australia.

Childhood deprivation foretells problems for America's children. One in five of our youngsters is born to poverty; half of America's children grow up in broken families; millions who attend underfunded schools will enter the workforce with inferior training, confronting a shrinking industrial job market. This same generation of children born in the eighties and nineties must contend with increasing economic competition from trade blocs in Europe and Asia. By mid-life, they will be saddled with the burden of supporting the retirement of the Baby Boom generation. If those workers can't compete internationally and can't support their elders domestically, there is a danger that the structure of our economic system could begin to collapse. Then it will no longer be a matter of people "falling through the cracks." America itself would plunge into poverty.

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## REPORT OF CASE

# Delayed eruption of a permanent molar associated with a complex odontoma: Report of case

Ali Salehi Rad, DDS  
James Reid, BDS, FDS, PhD

An odontoma is a slow growing and nonaggressive odontogenic tumor composed of enamel, dentine, cementum and pulp tissue.<sup>1,2</sup> Odontomas are classified as compound or complex. Compound odontomas comprise dental tissues, resembling the morphology of a tooth, are found commonly in the anterior maxilla, exhibit no sex predilection and are more common than complex odontomas.<sup>3</sup> Complex odontomas, in contrast, are unorganized masses of odontogenic tissues, morphologically not resembling the teeth of the normal dentition, account for approximately 25 percent of all odontomas and have a predilection for the posterior mandible in females.<sup>3</sup>

Odontomas result from the growth of epithelial and mesenchymal cells, exhibiting complete histogenic differentiation into functional ameloblasts and odontoblasts. These cells produce enamel and dentine in an abnormal pattern, because the organization of the odontogenic cells fails to reach a normal state of morphodifferentiation.<sup>4</sup> The etiology of odontomas is unknown, although local trauma, infection, and genetic factors have been suggested.<sup>5,6</sup>

Odontomas comprise 22 percent of odontogenic tumors of the jaws.<sup>2</sup> There is some controversy as to the frequency of location of odontomas: for example, depending upon the study quoted, the odontomas (compound and complex) either occur with equal frequency in the mandible and maxilla, or are more common in the maxilla.<sup>7,8</sup>

Odontomas frequently go undetected because they are often asymptomatic, depending upon size, location and their limited growth potential.<sup>9</sup> The odontoma is most often diagnosed in the second or third decade of life, during routine radiographic examination.<sup>10,7</sup> The usual presenting symptoms are an impacted or an unerupted tooth, a retained primary tooth, and, or a swelling.<sup>11,12</sup> Other less frequent signs and symptoms are pain, suppuration, expansion of alveolar bone and displacement of teeth.<sup>13</sup>

### RADIOGRAPHIC APPEARANCE

The complex odontoma manifests itself as a well-demarcated, radioopaque mass, surrounded by a narrow radiolucent band with a smooth outer periphery. In general the early appearance of odontomas is as a radiolucent mass; intermediate stages show mixed radiolucent-radiopaque masses; and mature odontomas present as radiopaque masses. In the last stage, compound odontomas have a structure similar to teeth, whereas complex odontomas are vague irregular opacities.<sup>14</sup> A developing odontoma may present difficulty in diagnosis on routine radiographic evaluation, because of the lack of calcification.

An odontoma has a limited growth potential, but should be removed since it contains various tooth formations that can predispose to cystic change, interfere with eruption of permanent teeth, and cause considerable destruction of bone.<sup>15</sup>

Drs. Rad and Reid are in the Department of Child Dental Care, Glasgow Dental Hospital and School, Glasgow, U.K.



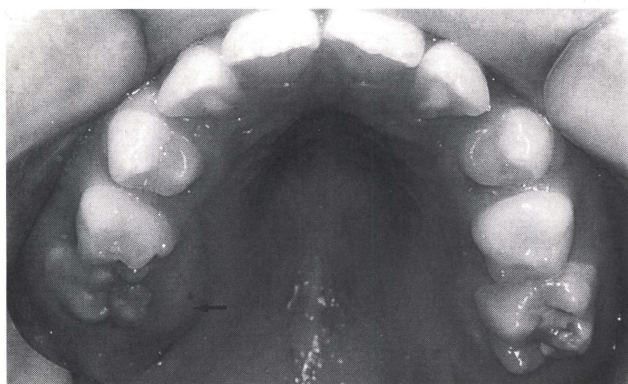


Figure 1. Preoperative clinical photograph of gingival swelling on palatal aspect of maxillary right first permanent molar.



Figure 2. Preoperative panoramic radiograph showing radiopacity in the area of the maxillary right first permanent molar and dens invaginatus in both maxillary lateral incisors.

## REPORT OF CASE

A ten-year-old male was referred to the Department of Child Dental Health, Glasgow Dental Hospital; regarding delayed eruption of a maxillary right first permanent molar with unusual cusp morphology. Clinically the tooth was partially erupted (one third of the crown was visible) with buccal expansion of the alveolar plate in that area (Figure 1). There was also a swelling on the palatal aspect of this tooth which was covered by inflamed gingiva. The swelling was pink, firm and nontender to palpation. The onset and duration of the swelling were unknown.

The patient's medical history was unremarkable with the exception of hay fever treated with nasal corticosteroids. The patient had an Angle Class III malocclusion. Both maxillary lateral incisors were dens invaginatus, but responded positively to sensitivity tests and had the palatal pits sealed at the first visit. There was no history of oral trauma. Periapical, occlusal and panoramic radiographs taken of the area disclosed an unusual radiopaque crown of the maxillary right first permanent molar; but unfortunately did not aid further diagnosis (Figure 2). A provisional diagnosis of either a distodens or an odontoma of first permanent molar was made. After consultation with the Department of Orthodontics, it was decided to remove the following teeth: maxillary right first permanent molar, second primary molar, first premolar; maxillary left first premolar, second primary molar; mandibular right first premolar and second primary molar; and mandibular left first premolar and second primary molar. The four primary second molars and the four first premolars were extracted in four separate sessions using local anesthesia. One month later the patient

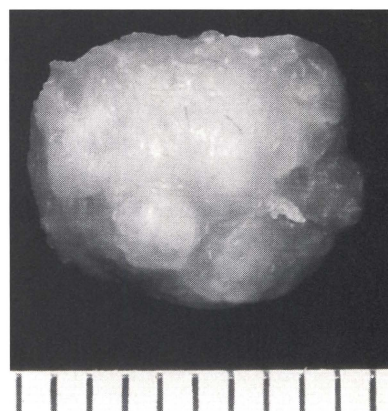


Figure 3. Odontoma after removal.

attended for extraction of the maxillary right first permanent molar using local anesthesia. During careful extraction an irregular mass of hard tissue was removed overlying the crown of the molar (Figure 3). At this stage no attempt was made to extract the first maxillary permanent molar. This irregular fragment was submitted for histological examination, which revealed that the hard tissue mass (7x5x4 mm in dimension) was a complex odontoma. The histological result also showed a heavy mixed bacterial growth on the surface of the tissue with a related acute inflammatory cell infiltration.

Oral examination one month later showed resolution of the palatal swelling and inflammation, and further eruption of the first permanent molar. Follow-up after three months showed complete resolution of the swelling and eruption of the first permanent molar to the

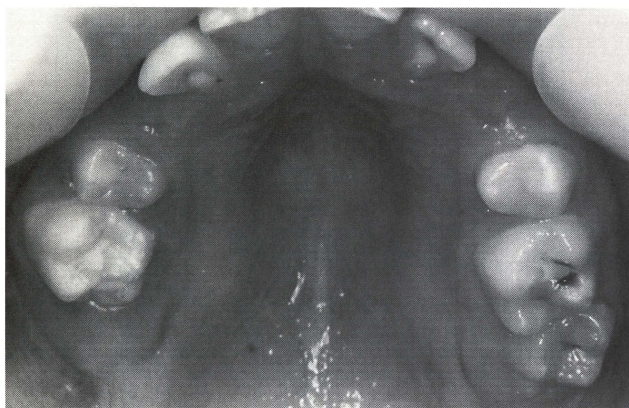


Figure 4. Three-month postoperative clinical photograph, showing satisfactory result.

occlusal plane. Fissure sealing was immediately completed (Figure 4).

## Discussion

As the less frequent presentation of odontomas is due to alveolar bone expansion and displacement of teeth, it seems worthwhile reporting this case as an unusual occurrence.<sup>13</sup> The difficult diagnosis of the case both clinically and radiologically highlights the importance of a careful approach and early detection.<sup>16</sup> This was emphasized by the fact that several teeth were recommended for extraction before orthodontic treatment. Certainly the loss of the maxillary right permanent molar would have complicated and lengthened the orthodontic treatment. No reports have been found confirming areas of gingival inflammation surrounding an odontoma/tooth complex, but it is likely that patient problems with oral hygiene in the area were responsible. The laboratory report confirmed the diagnosis of a complex odontoma

covered with a bacterial plaque and acute inflammatory cells. This case emphasizes the importance of a combined and conservative approach to such cases.<sup>17</sup>

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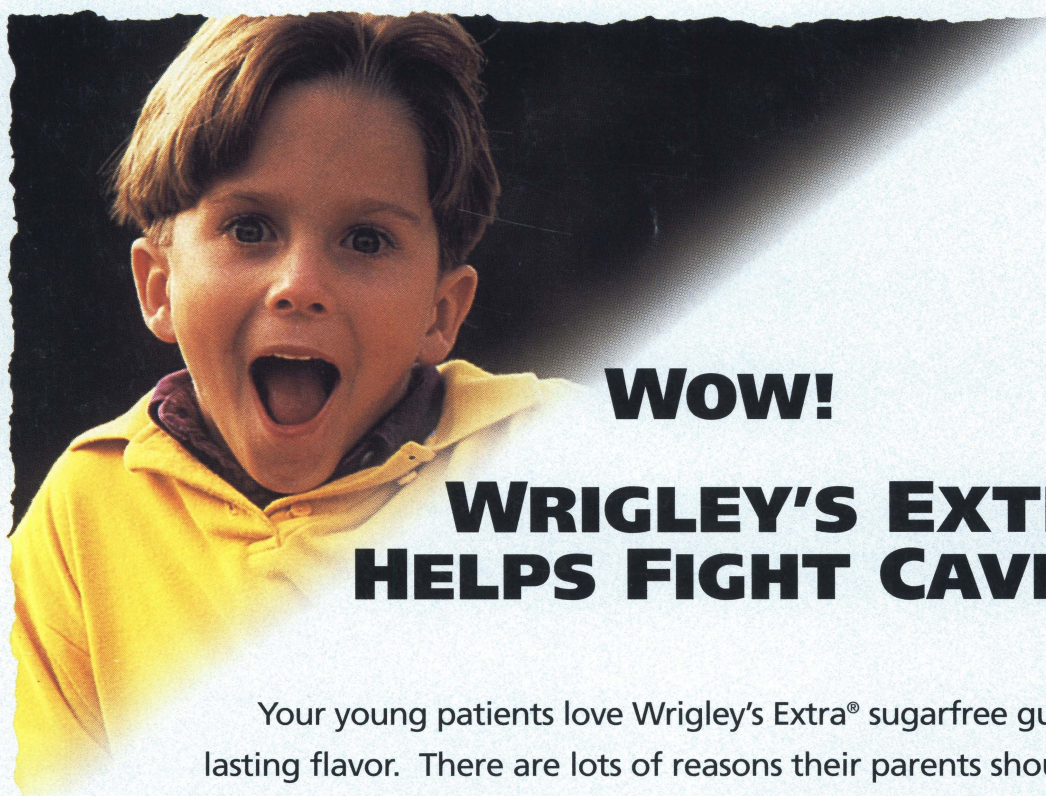
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Your young patients love Wrigley's Extra<sup>®</sup> sugarfree gum for its long-lasting flavor. There are lots of reasons their parents should love it, too. Chewing Extra after eating actually helps fight cavities by stimulating the flow of saliva, the mouth's natural defense.

Increased saliva flow from chewing Extra flushes out food particles from between teeth, neutralizes harmful plaque acids, and replaces vital minerals like calcium and fluoride. And that helps fight cavities.

Extra's long-lasting flavor also makes your patients want to chew longer. So the longer they chew (for up to twenty minutes), the better Extra works. The result is healthy, strong teeth. Great news for your patients, bad news for cavities.



**YOUR PARTNER IN  
PREVENTIVE DENTISTRY™**



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