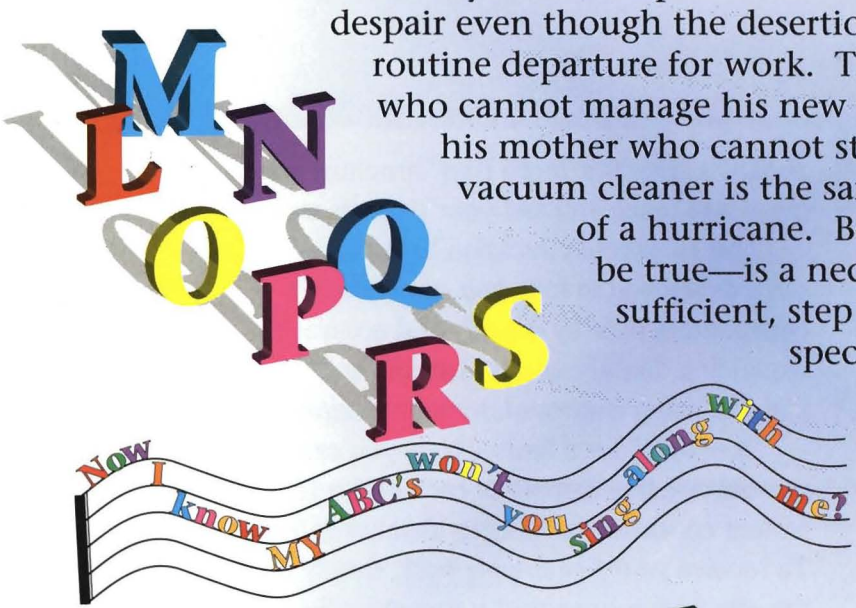
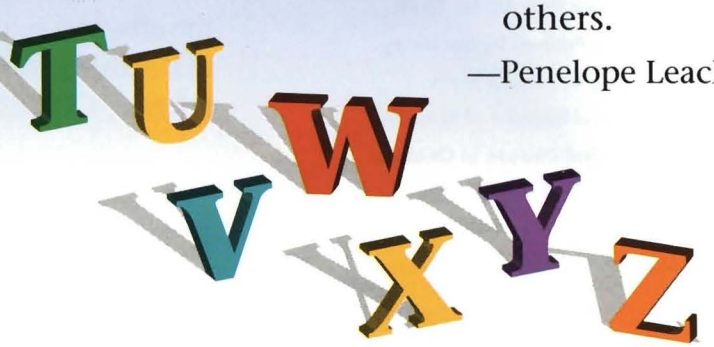
ASDC
AMERICAN SOCIETY OF DENTISTRY FOR CHILDREN
JOURNAL OF DENTISTRY FOR CHILDREN
JULY—AUGUST 1994

Children's feelings, so often missed or dismissed, regarded as temporary or disregarded as trivial, matter as much to them as our feelings matter to us—and sometimes more. That means that children's feelings merit at least equal considerations with the feelings of adults even when they are evoked or displayed in different ways. The despair of the baby who feels deserted is real despair even though the desertion is no more than a parent's routine departure for work. The frustration of the toddler who cannot manage his new toy is just as acute as that of his mother who cannot start her car. And fear of a vacuum cleaner is the same disabling emotion as fear of a hurricane. Believing that—knowing it to be true—is a necessary, though by no means sufficient, step towards meeting children's special childish needs within the context of their shared human rights, and gradual assumption of responsibility for themselves and towards others.

—Penelope Leach





IF THE CHILD IS SAFE EVERYONE IS SAFE.
—G. Campbell Morgan

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Adults who work with children should occasionally put themselves in the child's place, in order to refresh the perspectives of their relationships.

Art and design by Sharlene Nowak-Stellmach

CLINIC

EPIDEMIOLOGY

See you
in
Puerto Rico!

BEHAVIOR

DENTAL SERVICES

DEMOGRAPHICS

BABY BOTTLE SYNDROME

For the busy reader

Space maintainer cementation using light-hardened glass ionomer/resin restorative cement—page 246

The author presents a new, but clinically tested, use for light-hardened glass ionomer/resin cement. Space maintainers made of stainless steel orthodontic bands can be luted to the abutment tooth using one of these cements. Advantages are easy handling of the cement and saving of five to seven minutes of chair time, because of the rapid hardening of the cement.

Requests for reprints should be directed to Dr. Theodore P. Croll, Georgetown Commons, Suite 2, 708 Shady Retreat Road, Doylestown, PA 18901-3897.

Fevers in children—page 249

Dentists should be familiar with the pathophysiology of fever and the evaluation and management of the febrile child. Parents often associate elevated temperature with an oral condition, which accounts for the fact that the family dentist will frequently see the child before the physician does.

Requests for reprints should be directed to Dr. A. Jeffrey Wood, Assoc. Prof., Pediatric Dentistry, Medical College of Virginia, Virginia Commonwealth University, MCV Box 566, Richmond, VA 23298-0566.

An in-vitro investigation of microleakage and gap size of glass ionomer/composite resin "sandwich" restorations in primary teeth—page 255

The authors describe and evaluate the open and closed sandwich techniques, using a glass ionomer/composite resin, to restore primary molars. They were interested in determining gap size and extent of microleakage. The best results occurred with use of the open sandwich technique and when the cavity margin was in enamel.

Requests for reprints should be directed to Dr. James S. Reid, Department of Child Dental Care, Glasgow Dental Hospital and School, 378 Sauchiehall Street, Glasgow G2 3JZ, Scotland, U.K.

The intraoral use of EMLA cream in children: A clinical investigation—page 260

EMLA appears to be effective as a topical anesthetic. The authors compared EMLA to 5 percent lidocaine as a topical anesthetic before the administration of a local anesthetic. They also studied the influence of EMLA topical anesthesia on pulpal response to electrical stimulation.

Requests for reprints should be directed to Dr. John G. Meechan, Department of Oral Surgery, University of Newcastle upon Tyne, Framlington Place, Newcastle upon Tyne, England NE2 4BW, U.K.

Dental erosion in four-year-old children from differing socioeconomic backgrounds—page 263

Consumption of fruit juices and other soft drinks has shown a steady increase. They can cause severe dental tissue destruction with prolonged misuse. The authors discuss the prevalence of erosion in four-year-old children and the influence of socioeconomic grouping on erosion in these children.

Requests for reprints should be directed to Dr. Linda Shaw, University of Birmingham School of Dentistry, St. Chad's Queensway, Birmingham B46NN, England.

Predictors of dental anxiety in six-year-old children: Findings from a pilot study—page 267

The authors wished to determine whether psychological development, maternal influences, and dental experiences could identify dental anxiety in latency children. The *Behavior Screening Questionnaire* was used to assess the child's psychological development. The mothers described their children's daily behavior characteristics, dependencies, worries, and fears.

Requests for reprints should be directed to Dr. Ruth Freeman, Department of Paediatric and Preventive Dentistry, The Queen's University of Belfast, Royal Victoria Hospital, Grosvenor Road, Belfast BT12 6BP, Northern Ireland, U.K.

Hypnosis as an adjunct to the administration of local anesthetic in pediatric patients—page 272

The purpose of this study was to ascertain the acceptance of injection of a local anesthetic, using hypnosis in children. Twenty-nine children, between the ages of four and thirteen years, participated in the study. The children had no previous dental experience, had an ASA 1 classification, spoke English as a first language, and needed at least two appointments.

Requests for reprints should be directed to Dr. A. Jeffrey Wood, Assoc. Prof., Pediatric Dentistry, Medical College of Virginia, Virginia Commonwealth University, MCV Box 566, Richmond, VA 23298-0566.

Comparison of the sedative effectiveness of two pharmacological regimens—page 276

The purpose of the study was to evaluate, in a clinical setting, the degree of effectiveness of two orally administered drug regimens: The combination of chloral hydrate and diazepam, and the combination of chloral hydrate and diphenhydramine HCl. Statistically the first combination proved the better.

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

Dentists' perceptions of the variety of dental services provided for children—page 282

The purpose of the project was to describe the variety of dental services provided for children by general dentists and pediatric dentists. The responses to the survey came from 662 general dentists and 492 pediatric dentists. There are significant differences in the dental services reported to be provided for children.

Requests for reprints should be directed to Dr. Carole McKnight-Hanes, MCG School of Dentistry, 1459 Laney Walker Blvd., Augusta, Georgia 30912-1210, U.S.A.

Mom is out working: Who is taking care of the kids?—page 285

Many societal developments are affecting dramatically the traditional perspectives of our society, among them, the working mother. These changes cause health practitioners to modify their practice arrangements to accommodate them. Evolving is a complex system of child care, costing upward of $21 billion.

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

Children in rural areas: Extending the horizons of pediatric dental practice—page 289

Since the early part of this century, the number of nonfarm rural residents increased by almost 400 percent (from 16 to 63 million people). They constitute a quarter of this country's population. Pediatric dentists are encouraged to consider other than traditional urban locations—where residents are increasing their use of dental services, and the population is growing.

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

A study of baby bottle tooth decay and risk factors for 18-month old infants in rural Japan—page 293

The authors investigated BBTD and caries risk factors in population samples of eighteen-month-old infants in rural Japan communities undergoing routine government sanctioned dental examinations. All communities investigated in this study were nonfluoridated.

Requests for reprints should be directed to Dr. Peter K. Domoto, Department of Pediatric Dentistry, SB-26, School of Dentistry, University of Washington, Seattle, WA 98195.

CLINIC

Space maintainer cementation using light-hardened glass ionomer/resin restorative cement

Theodore P. Croll, DDS
Mark L. Helpin, DMD

Light-hardened glass ionomer/resin restorative cement was introduced in 1992.[1,2] The material has all the advantages of glass ionomers, and in addition includes a light-curing resin component. Initial cement hardening occurs within sixty seconds, by exposing the cement to a visible light beam and by the resultant polymerization of the resin component. As the hardening reaction progresses due to the glass ionomer acid-base reaction, physical properties of the material reach their maximum. Properties such as fracture resistance, fracture toughness, flexural strength, and wear resistance are much improved, compared to traditional glass ionomer materials.

The glass ionomer/resin cements are rapidly proving themselves useful in restoring primary teeth and for certain applications in permanent teeth.[1-6]

The senior author (Theodore P. Croll) acknowledges financial interest in BAND-CAPS by virtue of a licensing agreement with Rocky Mountain Orthodontics.

Dr. Croll is in private practice, pediatric dentistry, Doylestown, Pennsylvania; Clinical Professor, Department of Pediatric Dentistry, University of Pennsylvania School of Dental Medicine; Adjunct Professor, Department of Pediatric Dentistry, University of Texas Health Science Center at Houston (Dental Branch).

Dr. Helpin is Chairman, Department of Pediatric Dentistry, University of Pennsylvania School of Dental Medicine; Chief, Dental Division, Children's Hospital of Philadelphia.

The four-color photographs were paid for by a grant from 3M Dental Products Division.

A NEW APPLICATION

We have discovered a new use for light-hardened glass ionomer/resin. Space maintainers made of stainless steel orthodontic bands with soldered wires can be luted onto the attached abutment tooth using one of these cements. The chief advantages of this method are remarkably easy handling of the material and elimination of five to seven minutes of treatment time, due to rapid light-hardening of the cement rather than the prolonged self-hardening chemical reaction of orthodontic cements.

This "clinical communication" demonstrates cementation of a unilateral band and wire space maintainer using Vitremer brand restorative cement (3M Dental Products Division, St. Paul, MN).

TECHNIQUE

The stainless steel band/soldered wire space maintainer is cemented into place, using the following procedure:

- ☐ A preformed orthodontic band is seated on the abutment tooth and adapted in the usual manner. An irreversible hydrocolloid (alginate) impression is recorded. The band is then removed and placed in its exact position within the impression, secured with sticky wax, and a stone model is poured. Impression compound can be used instead of alginate.

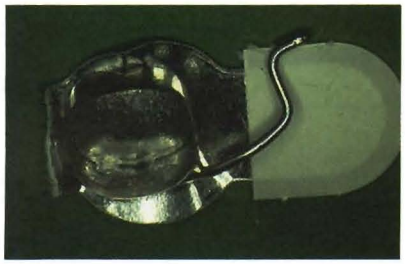

Figure 1. Space maintainer with adherent BAND-CAP, ready for cementation.

Figure 2. Glass ionomer/resin restorative cement injected to completely cover band interior.

Figure 3. BAND-CAP/space maintainer assembly compressed onto the tooth.

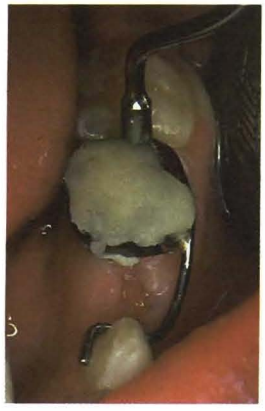

Figure 4. Serrated amalgam condenser completes band seating.

Figure 5. After soft cement excess is removed, light beam is applied for sixty seconds.

Figure 6. Space maintainer cementation with light-hardened glass ionomer/resin cement is completed.

☐ An .036 stainless steel orthodontic wire is bent to desired form. Wire design includes an appropriate resting section on the nonattached abutment tooth.[7] Wire soldering and finishing of the appliance are completed in the usual manner in the laboratory.

☐ After appliance "try-in" and any necessary wire adjustments, the internal surface of the orthodontic band is roughened with a diamond bur. An adhesive orthodontic "BAND CAP" (Rocky Mountains Orthodontics, Denver, CO) is placed over the occlusal surface of the band. This cap is designed to prevent cement escape during seating of the appliance (Figure 1).

☐ Three scoops of Vitremer brand restorative cement are spatulated with enough liquid to make a thick, yet creamy, mix. The cement is placed within an injection syringe tip (Centrix, Inc., Shelton, CT) and then injected to cover completely the interior of the orthodontic band (Figure 2). Great care is taken to avoid any air spaces at the cement/band interface.

☐ The appliance/BAND-CAP assembly is positioned on the tooth and pushed into place with finger pressure. A large serrated amalgam condenser is then used to press the band margins to their proper occlusal height on the tooth (Figure 3). An orthodontic band pusher could be used instead of the condenser.

☐ The BAND-CAP is removed and the serrated amalgam condenser then is used directly on the band margins for final adaptation (Figure 4). At this time, while the cement is still in its putty-like state, excess is removed with a large spoon excavator, and at the gingival margins, with an explorer.

☐ Using a 13mm wide visible light beam, the occlusal surface is exposed for sixty seconds (Figure 5).

☐ The space maintainer is now firmly secured in its proper position, due to early hardening of the cement from radiation of the visible light beam through the enamel (Figure 6). Additional hardening of the cement continues as the "dark cure" and glass ionomer acid-base reaction matures.[3,6]

DISCUSSION

This method offers several advantages over traditional cementation methods using zinc oxyphosphate polycarboxylate or traditional glass ionomer luting cements. Cementation with the light-hardened material is rapid, precise, and neat. In addition, slight residual moisture from the gingival sulcus should not significantly affect the cement, because its liquid component is an aqueous solution. Also, glass ionomer/resin cement bonds to the enamel and to the roughened internal surface of the stainless steel band, which enhances retention of the appliance.

Before using Vitremer for space maintainer cementation in a patient's mouth, we experimented in the laboratory with the technique. After embedding an extracted human third molar in plaster, an orthodontic band with a segment of .036 wire soldered to the buccal surface was cemented to the tooth, exactly as described here. Immediately after sixty seconds an attempt was made to dislodge the band by manipulating the wire with pliers. Considerable finger pressure was needed to break the cement bond and the cement was found to have hardened. On another tooth, we cemented another orthodontic band with the glass ionomer/resin cement. Immediately after sixty seconds of light exposure, the tooth and luted band were sectioned with a water-cooled diamond bur on the ultra high speed dental handpiece. The glass ionomer/ resin material was found to be hardened and firmly bonded to the tooth, around the full periphery of the crown (Figure 7).

Besides initial light-curing, Vitremer material undergoes two other hardening reactions. A chemical "dark cure" hardens the resin component of the cement, and the glass ionomer acid-base reaction also progresses for many hours after exposure to the light beam.[3,6] Besides strong physical properties, the glass ionomer/resin material is known to have good adhesion, leaching of fluoride ions for the anticaries effect, and resistance to dissolution in the mouth. The release of fluoride ions might be important in patients with high caries-susceptibility.

Figure 7. Extracted third molar with cemented orthodontic band was sectioned with a diamond bur, immediately after exposure to the light beam. Hardened cement is firmly attached to the enamel and steel band.

Because this method of band cementation is so new, potential longevity of attachment before recementation is required, is unknown. If this type of cement can remain in situ for two to five years, however, without the need for recementation, it will rival or exceed the abilities of currently used cements that take five to seven minutes to harden.

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Fevers in children

Donald E. Yeatts, DDS, MD
A. Jeffrey Wood, DDS
W. Jefferson McCarter, MD

Fever is one of the most common reasons that a family seeks medical attention for their child. In fact, fever is the major complaint in almost 30 percent of all patients who are seen by pediatricians.[1] If parents have reason to believe that an oral condition is the cause of their child's elevated temperature, they may initially bring their febrile child to a dental professional. Familiarity with the pathophysiology of fever and the evaluation and management of the febrile child will assure that actions in the best interest of the child are taken.

DEFINITION

Although most commonly considered to mean an elevation of body temperature beyond normal, fever is actually more complicated. It is the result of a well orchestrated, centrally mediated response to an insult to the body.[2] It is a different reaction entirely from hyperthermia wherein an elevated body temperature results from extrinsic conditions which overwhelm the body's normal thermoregulatory processes (i.e. malignant hyperthermia, heat stroke).[1]

Body temperature fluctuates within a normal range depending upon many factors, including activity. There is even a circadian rhythm to temperatures with the highest measurement between 5 PM to 7 PM and the lowest from 2 AM to 6 AM.[1] When the temperature is evaluated beyond certain values, the patient is said to have a *fever*. These values are commonly considered to be 38°C (100.4°F) rectally, 37.8° (100°F) orally, and 37.2°C (99°F) axillary.[3]

METHODS OF MEASUREMENTS

As noted, there are a variety of ways to measure temperature. For years, the mercury glass thermometer has been the method of choice, although it is gradually being supplanted for reasons of asepsis and speed by the electronic thermometer.[4] Measurement by either of these instruments may be accomplished orally, axillary, or rectally. Another method gaining increasing acceptance is the intraauricular thermometer. This device measures infrared radiation emitted by the tympanic membrane and provides an instantaneous temperature reading.[4] In addition, liquid crystal forehead strips have been advocated for ease of use and safety; they are not as accurate, however, as other methods, and significant fevers may be undiagnosed.[4]

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The technique of taking temperatures is very important. The measurement most reflective of body core temperature is the rectal temperature. It is the preferred method unless the minor rectal trauma that it causes is contraindicated, as in the neutropenic child. The patient is placed on his/her stomach and a well lubricated thermometer is inserted without forcing about 1 inch into the rectum. The buttocks are pressed together to stabilize the thermometer, which is removed after two minutes.[3] Oral measurements should not be attempted in patients younger than five to six years.[1] The child should not have had hot or cold food or drink immediately before measurement. The thermometer is placed in the posterior sublingual sulcus and left in place for three minutes.[3] The oral temperature will be about 0.5°C less than the rectal temperature.[1] If there is an oral inflammatory lesion present, measurement at that sight might give an erroneously high reading.[5] Axillary temperature is measured by placing the tip of the thermometer in a dry armpit and holding the elbow against the chest for four minutes.[4] The axillary temperature will be up to 1°C lower than the rectal temperature.[1]

PATHOPHYSIOLOGY

The fever response is a complex series of events that only recently is becoming well understood. The body's thermoregulatory center is located within the brain in the anterior hypothalamus. The preoptic nuclei of this organ consist of warm and cold sensitive neurons. They respond to the temperature of blood circulating near them and to stimuli from peripheral thermal sensors, primarily located in the skin. The responses of the preoptic nuclei to these stimuli (sweating and vasoconstriction, for example) are methods by which the thermostat in the hypothalamus maintains core body temperature at 37°C (98.6°F), the set-point of the hypothalamus.[6]

The fever response occurs when the hypothalamus elevates the set-point to a higher level, causing the body's core temperature to be elevated.[6]

The major substance that mediates the febrile response is interleukin-1 (IL-l). IL-1 has been known since 1948 and was previously called "endogenous pyrogen".[1] It is a polypeptide or a group of peptides contained within bone marrow derived phagocytes (monocytes, macrophages, neutrophils, and eosinophils).[1,7]

In response to processes such as infection, antigen-antibody mediated reactions, or tumors, IL-1 is synthesized and released by these phagocytic cells in the blood or tissue. IL-1 then enters the circulation and is carried to the central nervous system. At that location, IL-1 causes an increase in the production of prostaglandins, primarily prostaglandin E2, in the vicinity of the anterior hypothalamus. The prostaglandins cause the thermostat of the hypothalamus to elevate the set-point. Next, the temperature control region of the brain senses the core body temperature to be too low in relation to the new set-point and initiates processes to raise the body temperature to this new set-point. These actions involve increasing the metabolic rate and increasing the muscle tone and activity. Heat loss is diminished by decreased perfusion of the skin. This response continues until the newly elevated set-point is attained.[7]

CLINICAL APPEARANCE

The appearance of a febrile child, while not diagnostic, can be characteristic. Certain behavioral changes have been noted and studied. One of these changes is the seeking of warmth. A febrile child will attempt close contact with a warm person (most likely a parent), will want to be covered by a blanket, will sit near a warm stove or a heater, and will refuse cold liquids or foods. Febrile children will assume quieter activities instead of energetic ones and will become less communicative except to complain of discomfort and distress. Loss of appetite and complaints of headache are common. All of these responses are an apparent attempt on the body's behalf to conserve heat and maintain an elevated body temperature.[8]

This combination of behavioral adjustments, familiar to many parents, may prompt them to check the child's temperature by the "hand on the forehead" method or by more conventional means. Subsequently, they may seek medical or dental care. In younger children, parents may not recognize behavioral alterations, which can be fewer and more subtle. In infants, anorexia and irritability may be the sole indicators of fever. This difficulty in initially recognizing sickness by way of behavioral changes can delay treatment of serious illness.[8]

On presentation to the health care professional, other changes associated with the body's attempt to conserve heat may be noted. These changes reflect a hypermetabolic state and include flushed cheeks, an unusual glitter in the eyes, an elevated pulse rate (about 10 to 15 beats per degree of temperature elevation), increased respiratory rate, and hot, dry skin. Vasoconstriction

may be indicated by cold, pale, distal extremities. Mechanisms of temperature adjustment, shivering or sweating, may be present. The child may be dehydrated from inadequate fluid intake, sweating, or both. A dry mouth can reflect dehydration, although rapid mouth breathing can also contribute. Finally, central nervous system irritability could result in a febrile seizure.[1]

DIFFERENTIAL DIAGNOSIS

Some oral conditions that can result in a fever are acute alveolar abscess, late stages of juvenile periodontitis, and acute herpetic gingivostomatitis.[9,10] Teething, although generally felt to have no relation to fever, is still thought to cause elevated temperatures by many laymen and professionals alike.[11,12] Any suspicion of these or other oral conditions as the cause of their child's fever, can initially lead the parent to bring the child to their dentist (Table 1).

In determining the etiology of a child's fever, it is useful to classify the causes into broad categories (Table 2).[1] Although the causes of fever are many, the most common by far is infection, specifically viral infection.[1]

CLINICAL EVALUATION

The first step in the evaluation of a child brought in with a complaint of fever is to measure the child's temperature. An elevated temperature in itself rarely poses a problem, but the main task of the health professional is to diagnosis and treat the cause of the fever or to

Table 1 ☐ Conditions causing fever in children that might be mistaken by parents as being of dental origin.

	Common signs and symptoms (in addition to fever)	Treatment
Infectious mononucleosis	exudative tonsillitis generalized cervical adenopathy	symptomatic
Herpangina	2-3 cm ulcers on anterior tonsillar pillars, soft palate, and uvula	symptomatic
Lymphonodular pharyngitis	small yellow, white nodules on anterior tonsillar pillars, soft palate, and uvula	symptomatic
Hand, foot, and mouth disease	ulcers on tongue and oral mucosa; vesicles on palm, soles, and interdigital areas	symptomatic
Pharyngoconjunctival fever	exudative tonsillitis and conjunctivitis	symptomatic
Rubeola (measles)	Koplik's spots	symptomatic
Sinusitis	fullness or pain over sinuses, nasal congestion	decongestant; antibiotic
Otitis media	earache; irritability; ear discharge; red, bilging, immobile TM	antibiotic
Acute viral rhinitis	clear or mucoid rhinorrhea; nasal congestion	symptomatic
Acute purulent rhinitis	thick, yellow rhinitis that persists over one day	antibiotic
Buccal space abscess	facial swelling lateral to nose	I and D; antibiotics
Orbital cellulitis	proptosis; swelling, redness, and congestion of eyelid	antibiotics; hospital
Mastoiditis	postauricular pain; swelling of mastoid area	antibiotics; hospital
Peritonsillar abscess	severe sore throat, bulging tonsils, trismus, dysphagia, drooling	antibiotics; hospital
Diphtheria	malaise, rapid pulse, membrane in throat, swollen cervical lymph nodes ("bull neck")	antitoxin; antibiotic; hospital
Acute cervical adenitis	swollen neck; tender unilateral lymph nodes	antibiotics
Epiglottitis	abrupt onset, drooling, severe sore throat, respiratory distress	antibiotics; hospital
Pertussis (whooping cough)	rhinitis, sneezing, paroxysmal cough with high pitched "whoop" between coughs	supportive; hospital
Streptococcal pharyngitis	sore throat, cervical adenitis, tonsillar exudate	antibiotic
Retropharyngeal abscess	respiratory distress, hyperextension of neck, dysphagia, gurgling respirations, swelling on one side of the posterior pharynx	antibiotics; surgical drainage; hospital
Ludwig's angina	tender swelling of the floor of the mouth	antibiotics; hospital
Tularemia	bilateral tender cervical lymph nodes weakness, vomiting, exposure to rabbits or deerfly	antibiotics
Cat-scratch fever	solitary lymph node exposure to cats	supportive
Suppurative parotiditis	purulence expressed from Stenson's duct, swollen, tender, red parotid gland	antibiotics; hospital
Mumps	swollen parotid gland with obliteration of the angle of the mandible, preauricular percussion tenderness, mostly bilateral	supportive, steroids
Croup	barking cough, occasional respiratory distress	supportive; hospital if in distress
Herpetic gingivostomatitis	multiple ulcers (> 10) throughout the mouth, cervical adenopathy	antiviral
Chicken pox	multiple vesicular eruptions occurring in clusters	antiviral
Candidiasis	soreness of mouth, curd-like plaques in mouth that rub off	antifungal
Rocky mountain spotted fever	chills, headache, sore throat, nosebleed, myalgia, red macular eruption on wrists and soles, history of tick exposure	antibiotics
Lyme disease	arthritis, headache, chills, enlarging circular rash with clear center, history of tick exposure	antibiotic

Table 2 ☐ Causes of fever in children.

1. Infections
   - A. Central nervous system
     1. Meningitis
     2. Encephalitis
   - B. Upper respiratory tract and oral cavity
     1. Rhinitis
     2. Pharyngitis
     3. Otitis media
     4. Sinusitis
     5. Cervical adenitis
     6. Croup
     7. Pharyngeal abscess
     8. Epiglottitis
     9. Alveolar abscess
     10. Viral stomatitis
     11. Parotitis
   - C. Ocular
     1. Periorbital cellulitis
     2. Orbital cellulitis
   - D. Pulmonary
     1. Bronchitis
     2. Bronchiolitis
     3. Pneumonia
     4. Tuberculosis
   - E. Cardiac
     1. Myocarditis
     2. Pericarditis
     3. Endocarditis
   - F. Gastrointestinal
     1. Gastroenteritis
     2. Hepatitis
     3. Cholangitis
     4. Appendicitis
     5. Pancreatitis
     6. Mesenteric adenitis
     7. Intraabdominal abscess
   - G. Genitourinary
     1. Urinary tract infection
     2. Perinephric abscess
     3. Salpingitis
     4. Prostatitis
     5. Epididymitis
   - H. Musculoskeletal
     1. Septic arthritis
     2. Osteomyelitis
   - I. Skin
     1. Cellulitis
   - J. Systemic
     1. Bacterial sepsis
     2. Viruses
     3. Miliary tuberculosis
     4. Rocky mountain spotted fever
     5. Lyme disease
2. Collagen-vascular diseases
   - A. Acute rheumatic fever
   - B. Juvenile rheumatoid arthritis
   - C. Systemic lupus erythematosus
   - D. Polyarteritis nodosa
   - E. Serum sickness
   - F. Stevens-Johnson syndrome
3. Neoplasia
   - A. Leukemia
   - B. Neuroblastoma
   - C. Lymphoma
   - D. Ewing's sarcoma
4. Metabolic disease
   - A. Thyrotoxic crisis
   - B. Acute intermittent porphyria
5. Chronic inflammatory disease
   - A. Sarcoidosis
   - B. Inflammatory bowel disease
6. Hematologic disease
   - A. Sickle cell disease
   - B. Transfusion reaction
   - C. Intravascular hemolysis
7. Drug fever and immunization reaction
8. Poisoning
   - A. Aspirin
   - B. Atropine
   - C. Amphetamine, LSD
   - D. Antidepressants, phenothiazine
9. Central nervous system abnormalities
   - A. CNS lesion in hypothalamus/brainstem
   - B. Prolonged seizures
10. Factitious

make an appropriate referral. Though not as important as the appearance of the child, the actual temperature is significant. For each degree of temperature elevation, the chance that the child may be bacteremic increases.[13]

The doctor should always observe the child, looking for signs of distress. Children with decreased alertness, altered motor activity, decreased playfulness, increased irritability, or decreased consolability should be referred immediately to a physician for further evaluation.[13]

If none of the above signs or symptoms is present, the child's age should be considered next. An infant less than three months old with a rectal temperature of 38°C (100.4°F) should be referred to their physician immediately as there is a great chance that the infant is septic.[4] A temperature greater than 38.3°C (101°F) portends a 21.5 times greater risk for a serious infection in this age-group than in those older than three months. A temperature greater than 40°C (104°F) is related to a 36 percent chance that the infant has bacterial meningitis, pneumonia, or bacteremia.[15] These children will need a physical examination, chest x-ray, lumbar puncture with a cerebrospinal fluid analysis and culture, a urinalysis and culture, and a complete blood count and culture.[15]

Children three months to two years of age with a temperature of 38.9°C (102°F) or above, even without localizing signs, should be referred as well. A white blood cell count and an erythrocyte sedimentation rate test are appropriate for this group. WBC greater than 15,000 or a sed rate over 30 necessitates further evaluation and testing, because 15 percent of this age-group with these results are bacteremic.[1]

Children over two years of age are more likely to have signs and symptoms that are associated with a specific disease process. Without specific symptoms or signs in this age-group, immediate consultation with a physician is probably unnecessary. If these children have fever plus swollen joints, meningismus, labored respirations, dysuria, petechiae, or altered consciousness, however, they must be referred immediately.[1]

TREATING FEVERS

There is an increasing body of evidence that questions the treatment of fever. Elevated temperatures are associated with increased leukocyte mobility, increased leukocyte bactericidal activity, and enhanced interferon effect.[1] Also, fever is associated with a decrease in serum iron and an increase in serum ferritin, resulting in minimal free iron available to many pathogenic bacteria that require free iron for growth. In various studies of fish and reptiles, inability to mount a febrile response can be fatal; although, in mammal studies, the results are not as clear.[2]

Fever is not entirely beneficial. It may make a patient feel very uncomfortable, usually due to the increased metabolic rate, increased oxygen consumption, increased carbon dioxide production, or increased demands on the cardiovascular and pulmonary systems. In addition, elevated temperatures may trigger a febrile seizure, which, although generally benign and nonrecurrent, does cause alarm and may lead to a lumbar puncture, further medical tests, and additional expense.[2] Brain damage from fever does not occur until it exceeds 41.7°C (107°F).[3]

Ideally, the condition leading to the elevated temperature should be treated, but there is a subset of children who may be treated with antipyretic medication after physician evaluation. This includes children made uncomfortable by the fever, those with a history of febrile seizures, and children with underlying cardiopulmonary or neurologic disease.[2,3]

Because fever is the result of the elevation of the hypothalamic set-point, antipyretic medication should lower this set-point. Four medications that have been shown to do this are acetaminophen, aspirin, ibuprophen, and naproxyn.[2] Aspirin and acetaminophen are equally effective at similar dosages, but aspirin has fallen out of favor as an antipyretic medication in children because of salicylate's association with Reye's syndrome.[16] Ibuprophen and naproxyn are effective in lowering elevated temperatures, possibly over a longer period than aspirin or acetaminophen. Aspirin, naproxyn, and ibuprophen have other associated adverse effects such as gastritis, gastrointestinal bleeding, and impaired platelet aggregation, with aspirin being the worst. Acetaminophen is relatively free of side effects at therapeutic dosages.[2]

In patients with extremely high temperature, those in whom elevated temperature is absolutely contraindicated, those with liver disease, or those who show hypersensitivity to antipyretic medications, additional antipyresis may be attempted with tepid sponging. The water should be luke-warm and, if the patient shivers, the water temperature should be raised. The greater the surface area of skin that is sponged, the faster the body temperature falls.[3] Sponging with alcohol should be avoided as alcohol may be absorbed through the skin or alveolar membranes causing intoxication. Ice water sponging is indicated only in extrinsic heat illness.[2]

It should be noted that there is no relationship between success or failure of the fever's response to treatment and the likelihood of an infectious etiology; no clue to the fever's cause can be derived from the patient's response (or lack of response) to antipyretic medication or sponging.

Table 3 ☐ Guidelines for physician referral.[19]

Call physician immediately (urgent)
1. Child less than 3 months old with fever
2. Child's temperature > 105°F
3. Child is twitching, lethargic, inconsolable, has a stiff neck, or has a purplish rash
4. Breathing is difficult and no better after clearing the nose.
5. Child is high risk (eg. sickle cell disease, AIDS, leukemia, lymenoma, cardiopulmonary disease, neurologic disease, history of febrile seizures or other immunosuppressed patients)
6. Child is unable to swallow anything and drooling saliva
See physician within 24 hours (less urgent)
1. Child with temperature between 104°F and 105°F
2. Child with fever and between 3 months and 2 years old (unless fever is due to DPT shot)
3. Child with fever > 24 hours without obvious cause or location of infection.
4. Behavioral changes (quiet, not active, decreased appetite, symptoms such as cough, congestion, etc.)
See physician during regular office hours
1. Child with fever less than 105°F more than 72 hours
2. The parents want reassurance

PARENTAL EDUCATION

Finally, the health professional encountering the febrile child and his or her parents can perform an invaluable service by helping calm fears and providing information. Parents who are uninformed about fevers may become unduly alarmed. One study shows that parents believe a fever of 38.9°C (102°F) was *alarming* and a fever of 40°C (104°F) would cause serious neurologic sequelae.[17]

It is important to let the parent know that fever is a sign, but not a disease. Parents should understand that it is more important to monitor the child's behavior than the specific temperature. Parents and dental health care providers can benefit from physician referral guidelines about when to see a physician (Table 3).[18]

CONCLUSION

By being well informed about the etiology, the pathophysiology, and the management of a child with fever, the dental professional will be equipped to provide the best care for his patients and will be able to earn the confidence of the parents who bring their child with a complaint of *fever*.

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NICOTINE THRESHOLD FOR ADDICTION

That the pharmacologic actions of nicotine are important determinants of why people smoke is supported by studies conducted by the tobacco industry and by nonindustry researchers.

That nicotine addiction sustains tobacco use for most smokers is well established. Once a person is addicted to nicotine, quitting smoking is difficult, and more than 90 percent of the smokers who try to quit each year fail. An important, if not the most important, component of a policy to reduce tobacco use in the population is to prevent the development of nicotine addiction in young people. Young people do not start to smoke because they are addicted, but rather because of psychosocial and environmental influences, particularly peer influences, psychological factors, and advertising. Young people generally underestimate the addictiveness of nicotine, and most of them at first intend to smoke only for a few years. However, once they begin to smoke, many become addicted to nicotine, and this addiction sustains the self-injurious behavior into adulthood. The result of nicotine addiction is a 40 percent probability of premature death from illness caused by tobacco. It is difficult to prevent adolescents from experimenting with cigarettes. However, by regulating the availability of nicotine in tobacco products, it may be possible to prevent the transition from experimental or occasional smoking to addiction.

Benowitz, N.L. and Henningfield, J.E.: Establishing a nicotine threshold for addiction. N Engl J Med, 331: 123-125, July 14, 1994.

An in-vitro investigation of microleakage and gap size of glass ionomer/composite resin "sandwich" restorations in primary teeth

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The ingress of acids, ions, enzymes and their products through gaps at the interface of tooth and restoration has been termed microleakage.[1] This phenomenon may predispose a tooth to discoloration of cavity margins, recurrent decay, and pulpal inflammation.[2,3] Postoperative sensitivity has also been reported as a result of microleakage.[4,5] One reason suggested for microleakage is the gap produced at the tooth-restoration interface, caused by shrinkage during polymerization of a composite resin.[4,6-8] The acid-etching technique has reduced microleakage at the enamel-composite interface.[9-11] In spite of the introduction of a number of dentin bonding agents, microleakage is more often reported, however, where the cavosurface margin is placed on dentin or cementum.[8,12-15] The bond strength of resin materials to dentin is, although improving, less than to etched enamel and the polymerization shrinkage of composite resin may adversely affect bonding.[14,16] Improved restorative procedures have reported improved bond strengths to dentin and cementum.[17,18]

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More recently the use of a glass ionomer base combined with a composite resin in a *sandwich* technique has been advocated as a restoration to improve bond strength to dentin.[18,19] In addition this material leaches fluoride, which may prevent the recurrence of secondary caries.[20] Knibbs reported a two-year clinical study on the use of the *open* and *closed sandwich* techniques in permanent teeth. He stated that the *closed sandwich* technique appeared to be successful, whereas four out of five failures were related to the exposed glass ionomer in the *open sandwich* technique.

The purpose of this in-vitro investigation was to compare the abilities of the glass ionomer composite *open* and *closed sandwich* techniques to achieve a seal at the cavosurface margins of Class II cavities prepared in primary molars.

MATERIALS AND METHODS

Extracted human primary molar teeth that were stored in formalin were carefully examined for existing carious lesions, restorations, or fracture lines. Eighty teeth suitable to receive Class II restorations were selected for this study, lightly pumiced and stored in deionized water.

Class II cavities were prepared in each tooth with the gingival floor located apically or coronally to the amelocemental junction. Equal numbers of teeth had

the cavosurface margin of a proximal box located in enamel or in dentin/cementum.

Preparation was accomplished using a square-ended diamond fissure-bur (ISO 014) in a water-cooled, high-speed handpiece. Caries was removed using hand instruments. Two perspex gauges with parallel sides and width dimensions of 2.6 mm and 2.8 mm were used to ensure that the approximate dimension of each proximal box was a buccolingual width of 2.7 mm, i.e. between that of the two gauges. The width of the proximal box mesiodistally was approximately 1.4 mm, i.e. the diameter of the diamond bur (ISO 014). All tooth preparations were accomplished by one operator.

The teeth were divided into four equal groups and used in the *open* or *closed sandwich* technique:

- ☐ Group 1 *Open Sandwich* Technique In Enamel
- ☐ Group 2 *Closed Sandwich* Technique in Enamel
- ☐ Group 3 *Open Sandwich* Technique in Dentin/Cementum
- ☐ Group 4 *Closed Sandwich* Technique in Dentin/Cementum

Group 1

All cavity margins were finished in enamel. Before applying the glass ionomer the cavity was conditioned for fifteen seconds, washed and dried as per the manufacturer's instructions. Two measures of glass ionomer powder (Chemfil II*) were mixed with two drops of water for twenty to thirty seconds and a portion of the mixed material was placed into the cavity to cover the apical wall and gingival floor of the proximal box to a depth of 2 mm. The glass ionomer was carried to the periphery of the proximal box to a depth of 2 mm. After one minute the glass ionomer was protected by a thin layer of bonding agent (Prisma Universal*) applied carefully, using a sterile paper point. A further five minutes elapsed before an orthophosphoric acid-etch gel was applied to the enamel margins and left for thirty seconds. The gel was rinsed off for thirty seconds and the cavity air-dried for thirty seconds. An unfilled bonding agent (Prisma Universal*) was applied to the enamel and glass ionomer lining and light-cured according to the manufacture's instructions. A posterior composite resin (Prisma APH*) was placed in increments of 2 mm from a compule system compacted with hand instruments, and light-cured as per the manufacturer's instructions. This process was continued until the cavity was completely restored. The teeth were placed in deionized water.

Group 2

All cavity margins were finished in enamel. The application of cavity conditioner, mixing, and placement of the glass ionomer were similar to that for Group 1, except that the glass ionomer material was positioned short of the amelodentinal junction in the proximal box. The glass ionomer was protected, the enamel conditioned and bonded as described for Group 1. The posterior composite resin was placed in increments of 2 mm as described for Group 1; the only difference being that the composite resin was placed on the uncovered floor of the proximal box. The teeth were stored in deionized water.

Group 3

The cavosurface margin of the proximal box was finished on dentin/cementum; the remaining cavity margins were in enamel. The cavity conditioning, mixing, and placement of the glass ionomer were similar to that for Group 1. The glass ionomer was protected as before. The conditioning, bonding, and placement of the posterior composite resin were as for Group 1.

Group 4

The cavosurface margin of the proximal box finished in dentin/cementum. The remaining cavity margins were in enamel. The cavity conditioning, mixing, placement, and protection of the glass ionomer were as described for Group 2. The conditioning, bonding and placement of the posterior composite resin were as described for Group 2 except that the dentin was conditioned using a dentin bonding system as per the manufacturer's instructions (Prisma Universal 3*). The teeth were stored in deionlzed water.

The gap size between the restorations and the cavosurface margin on the proximal box was measured in microns using a Reflex Microscope**. Where more than one cavo-surface gap was observed, the maximum gap size measured was adopted for all further calculations, as this was considered to be the most clinically relevant.

The teeth in each separate group were incubated in deionized water at 37°C for one week. The teeth were

* De Trey Division, Dentsply Ltd, Weybridge, Surrey, England.

** Reflex Instruments, Somerset, UK.

removed, dried and the root ends sealed with cyanoacrylate cement. Two coats of red nail polish were applied to the surface of each tooth to within 1 mm of the cavity margins of each proximal box. The teeth were placed in 2 percent buffered methylene blue dye and thermocycled for 400 cycles through 37°C, 5°C, 37°C and 55°C, with a dwell time of fifteen seconds. The teeth were then stored in the dye for a further twenty-four hours at 37°C. The teeth were removed from the dye, rinsed thoroughly under running water and the nail varnish removed. The teeth were then sectioned mesiodistally, using a diamond saw through the center of the restoration. Microleakage was assessed by the extent of dye penetration according to the following criteria:

0 = no leakage
1 = leakage up to half way along the gingival floor of the proximal box
2 = leakage the full length of the proximal box
3 = leakage involving the axial wall
4 = extensive leakage extended toward the pulp

Statistical Analysis

The data for gap size were analyzed using a one-way analysis of variance, and group means were compared by use of Duncan's multiple range test with 95 percent confidence interval.

The data for the microleakage were analyzed using the Kruskal Wallis test, corrected for ties, to determine whether there were statistically significant differences amongst the four groups. Pairs of groups were analyzed using the Mann Whitney U test.

RESULTS

The mean gap size, together with standard deviation for the four groups are shown in Table 1. There were significant differences between the groups ($p<0.004$). Group 1 had a gap size that was significantly smaller than the other groups ($p<0.05$). There were no other significant interactions.

The leakage scores for each group are shown in Table 2. Analysis showed that there were significant differences between the groups ($p<0.001$). There was significantly more leakage in Group 4 than the other groups ($p<0.05$), and in turn, significantly more leakage in Group 3 than Groups 1 and 2 ($p<0.05$). There was no significant difference in leakage between Groups 1 and 2 ($p>0.05$).

Table 1 ☐ Results of statistical analysis for gap size.

	No of specimens	Mean gap size μm	± sd
	μm		
Group 1	20	0.0009	0.0006
Group 2	15	0.2039	0.1913
Group 3	20	0.091	0.1822
Group 4	19	0.1742	0.2392

Table 2 ☐ Leakage scores.

		Leakage Scores				
Group	No Of Specimens	0	1	2	3	4
1	17	15	1	1	0	0
2	15	12	3	0	0	0
3	18	5	8	3	2	0
4	18	3	3	5	7	0

In Group 1 there was leakage at the interface between the resin composite and the glass ionomer in four specimens. A number of specimens were lost during the microleakage study.

DISCUSSION

In this study it has been shown that the smallest mean gap size at the interface of restoration and cavosurface margin of the proximal box was found in the *open sandwich* technique finishing on enamel. This finding, as might be expected, led to the lowest microleakage scores at this interface.

The poorest results both for mean gap size and microleakage were found in the *closed sandwich* technique finishing on dentin/cementum. It is interesting to note that the *open sandwich* technique finishing on dentin/cementum gave a better result than either of the *closed sandwich* techniques. This may be partly explained by the lower bond strength of dentin bonding resins and shrinkage by polymerization of composite resins.[14,16] This result does not support the idea that the contraction forces occurring within a polymerizing composite resin are sufficiently strong to disrupt the bond between glass ionomer and enamel. In fact in four specimens in the *open sandwich* group there was leakage of dye at the composite resin–glass ionomer interface, indicating that the bond strength of glass ionomer to enamel was stronger than the bond strength of the composite resin to set glass ionomer. It has been shown that the bond strength between these three systems is sufficiently strong, however, to prevent de-

bonding and in fact results in fracture of the glass ionomer, especially if the bonding agent is applied immediately the glass ionomer sets.[22] In this study the bonding agent was applied immediately, which resulted in the greatest bond strength to unetched glass ionomer. Results of this study do suggest that the force of contraction during polymerization is more detrimental when dentin/cementum is involved.

The microleakage scores were lowest in this study when the *open sandwich* technique was employed. This is in accord with another published report.[23] It has been suggested that glass ionomer may have sufficient compressive strength after thirty minutes (100 MPa) to be used in posterior restorations.[24] A clinical report on glass ionomer cement used in the *open sandwich* technique for permanent posterior teeth concluded, however, that there were more unsatisfactory restorations, using this technique than when the *closed sandwich* technique was employed. Reasons suggested were technique difficulties with the *open sandwich* technique, dissolution and wear of the glass ionomer cement in the proximal area.[21] Another study again in permanent posterior teeth, concluded that because of the failure of the glass ionomer cement in the *open sandwich* technique, such a technique could not be advocated.[25]

A number of reports have recommended the use of glass ionomer cements as a restoration in primary teeth.[26-28] Although when compared to amalgam, glass ionomer cements perform less well as a restorative material, they were, nonetheless, still satisfactory.[24,29] The release of fluoride from glass ionomer cements may also help to reduce the incidence of recurrent caries.[30] It would seem that the *open sandwich* technique with restoration/tooth interface in enamel is worthy of use in primary teeth. The benefits would include, as shown in the present study, the smallest gap size and least incidence of microleakage.

CONCLUSIONS

- ☐ The *open sandwich* technique showed the smallest gap size and microleakage when compared with the *closed sandwich* technique.
- ☐ The best result showing the smallest gap size and least microleakage was for the *open sandwich* technique with cavity margins in enamel.
- ☐ The *open sandwich* " technique would seem suitable for use in primary molars.

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RECOMMENDATIONS ON THE USE OF FLUORIDE SUPPLEMENTS

A critical review of the literature was conducted to determine the current effectiveness of fluoride supplements in caries prevention and their role as risk factors for dental fluorosis. Use of fluoride supplements by young children is idiosyncratic and all of the studies which investigated the effectiveness of this regimen suffered from a significant drop in the number of participants receiving daily supplements. The scientific evidence supports the efficacy of fluoride supplements in caries prevention but there is weaker support for their effectiveness. Fluoride supplements are a risk factor for dental fluorosis, though their contribution to the increase in fluorosis prevalence is less than that of water fluoridation and fluoridated dentifrices because of their more limited and shorter use. There is also evidence that fluoride supplements are used inappropriately in fluoridated areas. The availability of optimal levels of fluorides in beverages in non-fluoridated communities raises the question of whether fluoride supplements are needed in the 1990s, and whether it is time to consider the total fluoride intake not only from water but also from foods, beverages, and dentifrices, when recommending supplements. A re-evaluation of the need for and dosage schedules of fluoride supplements is warranted.

Ismail, A.I.: Fluoride supplements: current effectiveness, side effects, and recommendations. Community Dent Oral Epidemiol, 22:164-172, June, 1994.

The intraoral use of EMLA cream in children: A clinical investigation

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There are a number of different types of topical anesthetic agents for intraoral use available and they appear to be equally effective in obtaining surface anesthesia of the oral mucosa.[1] In some sites, such as the palate there is evidence, however, that EMLA is more effective than "conventional" intraoral topical agents.[2]

This study investigated two aspects of the use of EMLA in child patients. Firstly, EMLA was compared to 5 percent lidocaine as a topical anesthetic before the administration of local anesthesia; secondly, the influence of EMLA topical anesthesia on pulpal response to electrical stimulation was studied.

MATERIALS AND METHODS

A comparison of EMLA and 5 percent lidocaine topical anesthetic before local anesthetic injections

Twenty children who required restorative treatment to two maxillary teeth symmetrically placed on either side of the midline participated in the study after written informed consent was given by a parent. Following drying of the mucosa a topical anesthetic was placed in the mucobuccal fold in the area of needle penetration, using a cotton applicator and left in position for five minutes. Approximately 0.5g of the anesthetic agent was used. On one side the topical anesthetic was 5 percent lidocaine and on the other side EMLA. The local anesthetic was then administered in the normal fashion and the child was asked to rate the discomfort of the injection on a 100mm visual analogue scale with caricatures of a smiling child at one end and a tearful child at the other (Figure 1). The distance along the scale from the smiling caricature was taken as the pain score. In addition the child was asked which side was the least painful.

The pain scores on each side were compared by the paired t test.

An investigation into the effect of EMLA on pulpal response

A different group of twenty children requiring restorative treatment to teeth symmetrically positioned on either side of the maxillary midline participated in this part of the study after written informed consent was received from a parent. The teeth were pulp tested (Analytic Technology, Redmond, Washington) and then, following mucosal drying, topical anesthetic or placebo was placed in the mucobuccal fold over the region of the apex of the tooth being treated in the manner described above. The placebo was identical to the active EMLA cream in all aspects apart from the fact that the anesthetic agents were not present and thus the clini-

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Figure. The visual analogue scale used to assess pain experience during injection of local anesthetic in the buccal fold in the maxillary anterior region.

cian was blinded. After the cream was removed the teeth were pulp tested again and restorative treatment began. If the child complained of pain a local anesthetic injection was offered. The differences in pulp tester readings before and after the application of the active or placebo creams were compared by the paired t test.

RESULTS

The results are shown in Tables 1 and 2 . The data in Table 1 indicate that there was no significant difference in the pain experienced during infiltration anesthesia between sides treated with EMLA and 5 percent lidocaine (t = 1.2, 19 degrees of freedom).

EMLA was not significantly different from placebo in the changes produced in the pulpal response of maxillary primary teeth following a five-minute application of the cream in the anterior maxillary buccal fold (t = 1.1, 19 degrees of freedom) (Table 2).

Table 1. ☐ Visual analogue scale scores for injection pain (mm)

Age	Lidocaine	EMLA
6	38	30
8	7	0
5	38	38
5	0	0
8	27	37
15	20	20
7	7	37
7	22	22
9	35	0
12	23	15
7	30	30
7	32	5
6	5	5
5	5	5
6	35	35
6	20	20
6	25	0
5	25	25
10	15	5
6	35	30
Mean	22.2	17.9
S.D.	12.1	14.3

Table 2. ☐

	Increase in pulp test score		Pain on drilling	
Age	Placebo	EMLA	Placebo	EMLA
5	7	3	Yes	Yes
6	5	41	Yes	No
5	2	−4	Yes	Yes
9	14	42	No	Yes
6	5	24	Yes	Yes
5	1	5	Yes	Yes
6	4	7	Yes	Yes
7	−1	9	Yes	Yes
5	14	11	Yes	Yes
5	37	32	Yes	Yes
6	13	2	Yes	Yes
6	22	0	Yes	No
7	6	−4	Yes	Yes
6	−10	27	Yes	Yes
5	6	5	Yes	Yes
6	13	10	Yes	Yes
5	−1	5	Yes	No
6	13	8	No	No
6	7	11	Yes	No
5	1	−3	Yes	Yes
Mean	7.9	11.6		
S.D.	9.9	14.1		

A negative number indicates that the pulp responded at a lower level of stimulation following the application of the cream.

DISCUSSION

EMLA is a 5 percent eutectic mixture of the amide local anesthetic agents lidocaine and prilocaine. Previous placebo-controlled trials have shown EMLA to be an effective intraoral topical anesthetic.[3] EMLA has been shown to be as effective as 10 percent lidocaine when applied topically to oral mucosa in adults.[4] One advantage which has been reported for EMLA is an improved efficacy of palatal anesthesia in adults when compared to both 2 percent lidocaine and 5 percent lidocaine after a five-minute application, although both EMLA and 5 percent lidocaine were equally effective in the buccal fold when applied for two minutes.[2,5] None of these earlier studies investigated children.

Visual analogue scales are regarded as the most sensitive measurements of pain experience in adults.[6] Manner *et al* found a good agreement between visual analogue scales and a verbal scale in assessing pain experience in children as young as four years of age.[7] The youngest child in the present investigation was five years of age. In the present study as well as completing the visual analogue scale, the children were asked to compare sides and the results of this comparison verified their understanding of the scale. The data from the present study with children confirm the results of previous investigations in adults. There was no significant difference in the ability of EMLA and 5 percent lidocaine in alleviating the pain of maxillary infiltration anesthesia in the buccal fold in children. Other workers have noted that there is little difference in the efficacy of "conventional" intraoral topical agents and the results of the present study indicate that EMLA offers no advantage in the site investigated.[1]

EMLA suffers from a number of practical disadvantages in comparison to other intraoral topical anesthetics. Firstly, the taste is unsatisfactory, especially as some other agents are produced in flavors such as "bubble-gum", which have proved popular with children. Secondly, due to the low viscosity of the cream, it is difficult to maintain EMLA in contact with the area of interest.[2] This problem might be overcome by using topical anesthetics contained in orahesive bandages.[8]

The ability of EMLA to penetrate skin and produce significant levels of the anesthetic agents in local vessels has been demonstrated and this suggested that there might be an influence on pulpal nerves.[7] The results of the second part of the investigation have shown five-minute applications of EMLA and placebo in the buccal fold do not differ significantly in their effects on the pulpal response of maxillary primary teeth. A five-minute application of EMLA alone did not produce satisfactory anesthesia for restorative procedures in the maxillary primary teeth in the majority of patients studied.

The time of application chosen for both parts of this study was five minutes as this is considered the limit of practical usefulness in the oral cavity and the topical application of EMLA for four minutes has been shown to be effective in oral mucosa in adults.[2,3] The time of application is important when systemic effects are concerned. Engsberg *et al* measured the uptake of EMLA in children following application to the skin and noted that the use of 2g over a 16cm^2 area for four hours never produced plasma levels of either active agent in excess of 155ng/ml, which is well below the toxic concentration of around 5μg/ml.[9] Interestingly, a case of methemoglobinemia (which is a recognized sign of prilocaine toxicity) has been reported following the use of EMLA in a child.[10] The patient was twelve weeks old and in addition to EMLA was receiving a sulfonamide which can also induce methemoglobinemia. Such interactions should be considered when prescribing EMLA especially in younger individuals.

The results of the present investigation suggest that there is no advantage to be gained in using EMLA compared to conventional intraoral topical anesthetics when placed in the buccal fold in children. It appears that, at present, the use of EMLA in pediatric dentistry is limited to the reduction of the discomfort experienced during intravenous cannulation, a function it performs effectively.[7,11]

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EPIDEMIOLOGY

Dental erosion in four-year-old children from differing socioeconomic backgrounds

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The problem of dental erosion has been recognized for many years. Although its etiology is multifactorial, erosion arising from acidic dietary components represents the most common factor. A variety of substances in the diet, including certain foods and beverages, are acidic in nature and have the potential for causing dental erosion, if consumed in sufficient amounts.[1-4] Consumption of fruit juices and other soft drinks has increased enormously in the last twenty years, particularly in North America.[5] Drinks have been developed specifically for the infant market and these baby fruit juices have been shown to give rise to extreme dental tissue destruction with prolonged misuse.[6] Dental erosion caused by gastroesophageal reflux disease in young children has also been documented.[7]

It is extremely difficult to separate the different etiological factors in tooth tissue loss; erosion is the loss of dental hard tissues by chemical means that does not involve bacteria, but undoubtedly both abrasion and attrition are compounding features. Attrition of the incisal edges in the primary dentition is almost always evident by the time of exfoliation, but abrasion in the primary dentition is uncommon. It has been shown, however, that significantly more tooth substance is removed during toothbrushing if this has been preceded by consumption of erosive drinks or food.[8] Tooth tissue loss in the primary dentition as in the permanent dentition may be mainly due to erosion, but there will always be a component of abrasion or attrition, however small.

Severe tooth tissue loss in the primary dentition, from whatever cause, is particularly harmful because of the thinner layers of dental tissues. Unfortunately there is little information on the general prevalence and severity of erosion in children and only anecdotal evidence to suggest that the problem is increasing. The aim of the study was to determine the prevalence of erosion in four-year-old children and to investigate the influence of socioeconomic grouping on erosion in these children.

MATERIALS AND METHOD

The classification of erosion used in this study was based on the Tooth Wear Index of Smith and Knight (1984).[9] After extensive clinical testing on children of a wide age-range, however, some modifications were made; these are detailed in Table 1, which gives the diagnostic criteria.

Initial training and calibration using the index was followed by a reproducibility study on forty, 4- to 5-year-old children.

As well as recording the buccal, occlusal/incisal, and lingual surfaces for each tooth present, the children were also classified into one of three groups:

☐ Low erosion: Scores of 0 and 1 for all teeth

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Table 1 ☐ Diagnostic criteria for Erosion Index.

Score	Surfaces	Criteria
0	B/L/O/I	No loss of enamel surface characteristics.
1	B/L/O/I	Loss of enamel surface characteristics.
2	B/L/O	Loss of enamel, visible dentine for < one third of the surface.
	I	Loss of enamel with visible dentine.
3	B/L/O	Loss of enamel, visible dentine for > one third of the surface.
	I	Loss of enamel and substantial loss of dentine, but not exposing pulp or secondary dentine.
4	B/L/O	Complete loss of enamel, or pulp exposure, or exposure of secondary dentine.
	I	Pulp exposure or exposure of secondary dentine.
9		Excluded from analysis. (Teeth with large restorations, extensive caries or traumatized.)

* In case of doubt a lower score is given
B = buccal or labial, L = lingual or palatal, O = occlusal, I = incisal

Table 2 ☐ Numbers of children examined in the different schools.

School	Number examined	Socioeconomic group/catchment area
I	25	Low: Inner city deprived area, social priority school
II	35	Low: Inner city deprived area, social priority school
III	23	Middle
IV	59	Middle
V	36	High: socioeconomic groups I and II

☐ Moderate erosion: Any surfaces with scores of 2
☐ Severe erosion: Any surface with scores of 3 and/or 4

The incisal edges of primary incisor and canine teeth were excluded from this analysis, as these surfaces are particularly subject to attrition.

A total of 178 children, eighty boys and ninety-eight girls ages between 4 and 5 years, were assessed in five differing schools. These schools were selected because they had very clearly defined catchment areas of uniform socioeconomic background. All the schools were situated in an optimally fluoridated water area.

Table 2 gives details of the number of children in each school and information on their socioeconomic background.

The data were analyzed using nonparametric statistics: the chi squared test for independent samples and the Kappa statistic for the reproducibility data.

RESULTS

The training and calibration exercises enabled the diagnostic criteria for the erosion index to be finalized and the procedure simplified, so that even comparatively young children could be examined. The reproducibility studies gave a weighted Kappa statistic value of 0.93, indicating very good agreement.

Table 3 shows the total scores for the erosion index by tooth surface for the 178 children who participated in the main study. The majority of tooth surfaces showed loss of enamel surface characteristics (score 1). A considerable number of the incisal edges of the incisor and canine teeth had scores of 2 or more, indicating visible dentine. Much of this tooth tissue loss could be attributable, however, to attrition. The surface showing the most extensive hard tissue loss attributable to erosion, was the palatal aspect of the upper incisor teeth. Over 30 percent of these surfaces showed visible dentine, with almost half of these having scores of 3 and 4.

Table 4 indicates the percentage of children falling into the categories of low, moderate, and severe erosion in the five different schools. The children in schools I and II come from an inner city deprived area of low socioeconomic background. There was very little erosion seen in the children from these schools, with only one child having moderate erosion and eight having severe erosion with extensive areas of visible dentine. The children from the higher socioeconomic groups showed a more even distribution into the categories of low, moderate, and severe erosion, but only approximately one third of these children showed low levels of erosion with almost one fifth being in the severe erosion category.

Thus the children from the low socioeconomic groups had statistically significantly less erosion than those from the higher socioeconomic groups ($F = 5.78$, $p = 0.05$).

DISCUSSION

There are few epidemiological data on the prevalence of erosion, but anecdotal evidence indicates that it is an increasing clinical problem. This present study provides the first information on the levels of erosion found currently in a population of young children. This should establish a baseline from which to monitor the clinical situation. There are changing patterns of food and beverage consumption with an increase in soft drink sales from 87 liters per head of the population in 1960 to

Table 3 ☐ Erosion index, surfaces scores: all 178 participants.

		E	D	C	B	A	A	B	C	D	E
UPPER	Buccal										
1		161	168	175	163	159	153	158	169	159	158
2					7	7	8	11		1	
3						1	1				
4											
	Occlusal/ Incisal										
1		149	118	193	92	75	73	99	101	120	146
2		19	47	70	68	78	72	62	72	31	11
3			2	2	10	14	15	8	1	3	2
4					1	1	1	1			
	Lingual										
1		160	169	165	126	113	109	136	172	161	159
2		1		7	27	29	33	21	1		
3				4	16	20	14	10		1	
4					2	6	7	3			
LOWER	Lingual										
1		155	164	175	178	168	165	174	169	164	155
2				1		2	2	1	1		1
3									1		
4											
	Occlusal/ Incisal										
1		130	126	133	139	133	131	146	119	126	135
2		22	36	42	37	36	35	28	51	35	18
3			3	1	2	1	1	1	2	4	
4											
	Buccal										
1		155	164	175	177	170	167	175	170	164	155
2										1	1
3											
4											

Table 4 ☐ Percentage of children with different levels of erosion from each school

(Excludes incisal edges)

School	Low		Moderate		Severe	
1	Percent	(No)	Percent	(No)	Percent	(No)
I	96	(24)	0	(0)	4	(1)
II	78	(27)	2	(1)	20	(7)
III	43	(10)	39	(9)	18	(4)
IV	30	(18)	53	(31)	17	(10)
V	36	(13)	45	(16)	19	(7)

272 liters in 1991 in the USA. This may be of direct relevance to levels of erosion and should be investigated, particularly in the child population.

In order to study the prevalence of erosion it was necessary to use simple reproducible diagnostic criteria. Of the indices available for the assessment of tooth tissue loss, the Smith & Knight (1984) Tooth Wear Index has become the most widely accepted.[9] The original index measured tooth tissue loss from all sources, however, including attrition and abrasion as well as erosion. It was also designed for use in the permanent dentition and in an adult population. Attrition is a significant feature on the incisal edges of incisors and canines in the late primary dentition stage. These surfaces do not give meaningful information concerning tooth tissue loss due to erosion and were, therefore, excluded from the final analysis of the children into low, moderate, and severe categories of erosion.

It can be seen that nearly half the children examined showed some signs of erosion. The most common site affected was the palatal surface of the upper incisors. When considering the influence of socioeconomic group on the prevalence of erosion, four of five children examined in the low socioeconomic group showed low levels of erosion, compared with only two children of five in the higher socioeconomic groups. The observed differences between the socioeconomic groups may be related to differing dietary patterns, which were not determined in this study. In addition, other factors including oral hygiene practices may be relevant. It has

been well documented that oral hygiene improves with rise in socioeconomic status.[10,11] Davis and Winter (1988) reported a significant acceleration of abrasion during tooth brushing following demineralization caused by exposure to dietary acids.[8] This, together with the possible protective effect of the mature pellicle against acid attack, may provide some explanation for this observation.[12,13]

This study has highlighted significant dental erosion in young children, which will require careful attention by dental practitioners. The erosion index will be useful in identifying those patients who may be particularly at risk of later developing severe tooth tissue loss in the permanent dentition. Any patients found to lie within the severe group of tooth tissue loss, require detailed dietary analysis and advice, in conjunction with appropriate oral hygiene instruction. This may well help to prevent symptoms developing and complex restorative care being required in the permanent dentition should the deleterious habits persist.

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WATER FLUORIDATION: EFFECTIVENESS AND FLUOROSIS

This paper reviewed the literature on the evidence for water fluoridation's effectiveness under current conditions of multiple fluoride use at recommended and at reduced concentrations, the extent of dental fluorosis at different fluoride concentrations, and the "halo" effect of water fluoridation. Using the relative difference in dental caries between communities with low and optimal water fluoride as an indicator, the effectiveness of water fluoridation has decreased over time as the use of other fluorides has increased. Thus the effectiveness of water fluoridation alone cannot now be determined. Compared to the early fluoridation studies, the differences in dental caries and fluorosis prevalence between fluoridated and nonfluoridated areas have markedly narrowed. Both the prevalence and severity of dental fluorosis have increased since 1945; however, the portion of fluorosis due to water fluoridation is now less (40 percent) than that attributed to other fluoride sources (60 pecent). Research also suggests that the "halo" effect of community water fluoridation may result in a significantly greater intake of fluoride for people in nonfluoridated communities. This review recognized that since water fluoridation has unique advantages from the perspectives of distribution, equity, compliance and cost-effectiveness over other fluoride technologies, it remains as the fundamental base for caries prevention. The increasingly greater contribution that other sources of fluoride make to dental fluorosis suggests that these sources of fluoride, many of which are used on an elective basis, should be more closely examined for needed changes.

Lewis, D.W. and Banting, D.W.: Water fluoridation: Current effectiveness and dental fluorosis. Community Dent Oral Epidemiol, 22:153-158, June 1994.

BEHAVIOR

Predictors of dental anxiety in six-year-old children: Findings from a pilot study

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It is important for dentists in practice to be able to assess dental anxiety in their child patients in order to identify those who are of special need with regards to their dental anxiety status.

Previous studies have examined child dental anxiety in children referred to departments of pediatric dentistry, because of their dental fear. These studies looked specifically at factors external to the child, shown to be important: maternal and paternal dental anxiety, peer group influences, as well as the socioeconomic background of the child.[1-6] While others showed that dental factors such as previous dental experiences, the instruments used and whether the dentist wore a white coat could trigger fear in the child patient.[7-10]

The issues of gender and age of the child patient, however, remained areas of disagreement. Some studies found that girls were more fearful than boys; others found that there was no difference, while another highlighted the role of age as a co-factor with gender.[6,8,11-13] Only after a certain chronological age did differences in dental anxiety between boys and girls become apparent. Chronological age seemed important since it had a synergistic effect, which could heighten or diminish dental anxiety in both boys and girls. Nevertheless, by the ages of six or seven dental anxiety decreased, with most children being able to cope with the dental situation.[13]

It seemed that chronological age could be used, therefore, as a predictor of how a child would respond to dental treatment. Anna Freud disagreed.[14] She insisted that the chronological age was a poor indicator of how any child would react to a potentially anxiety-provoking situation. She suggested that the level of psychological development was a better predictor. The importance of the chronological age of six to seven years was that the child should be entering a stage of psychological development known as *the latency period*. A child in latency would be expected to be relatively independent of parents; have good relationships with peers and siblings, few food fads, good bowel and bladder control; and be able to sleep through the night. In addition it would be expected that children entering latency would also be able to cope with the potentially anxiety-provoking experience of dental treatment.[13]

It was with this thought in mind that this pilot study was undertaken. Could such psychological developmental factors be used to assess and identify children, who might be dentally anxious? Nevertheless, other factors were important: maternal dental anxiety, the socioeconomic background and gender of the child, previous dental experiences, and dental attendance patterns.

This study interviewed children in their seventh year of life, with their mothers, in order to assess dental anxiety status. The aim was to learn whether psycho-

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logical development, maternal influences, and dental experiences could identify dental anxiety in latency children.

MATERIALS AND METHODS

The sample

A random sample of sixty school children with their mothers who were attending schools for routine medical inspections were invited to take part. Children in their seventh year were specifically chosen, since they would be entering the latency period of their psychological development.

The interview

The child and mother were interviewed separately. The rationale behind this approach was to allow the mother to discuss freely their child's physical and psychological development. For example, the mother was encouraged to discuss their child's friends, the child's concentration at home and at school, eating and sleeping habits, and so forth. In short anything the mother thought was pertinent to their child's behavior and development.

The child interview

The child sat beside the interviewer (BC), away from the mother and in a room distant from a dental surgery. Venham's *Assessment of Dental Anxiety in Children Inventory* was administered to each child. This questionnaire is composed of eight pairs of cartoon style drawings of a child attending the dentist. The child was asked to choose one figure from each pair that best expressed how (s)he felt about going to the dentist. A score of 1 was recorded each time the child chose the 'more anxious' of the figures in any pair. The child could score, therefore, anything between 0 and 8.

The mother interview

The mother's interview was composed of two parts. The first part was concerned with the child's experiences with and responses to dental treatment and the child's psychological development. The second part was concerned with the mother's experiences with and responses to dental treatment, and her psychological profile.

The mother was asked to report the child's previous behavior during dental treatment: for example, had the child been overly anxious, cried or been unable to settle in the dental chair (reported disruptive behavior). She was also asked to comment on the child's attendance pattern, or if the child had had a traumatic experience at the dentist: for example, emergency extraction of teeth using general anesthesia.

The assessment of the child's psychological development was made using the *Behavior Screening Questionnaire*.[16] The mothers were encouraged to describe their children's eating habits, bladder/bowel control, sleeping habits, tendency for hyperactivity, concentration span, relationships with siblings and friends, dependency on parents, moods, temper tantrums, worries, and fears. This information was then condensed to form scores in twelve areas associated with psychological development. A score of 0 corresponded to normal development, whereas scores of 1 and 2 represented increasingly frequent or severe problems in specific areas of development.

Questions were asked about the mother's own attitudes to dental treatment: for example, regularity of attendance. In addition, their dental anxiety status was assessed using *Corah's Dental Anxiety Scale*.[17] The subject was asked about their feelings regarding the dental visit:

- ☐ On the day before
- ☐ In the waiting room
- ☐ In the dental chair while the dentist "gets his drill ready to begin working on your teeth".
- ☐ In the dental chair waiting to have their teeth scaled.

The four questions are scored from 1 to 5, depending on how relaxed or anxious the subject feels, giving a total score of between 4 and 20. Those who would be considered dental phobics scoring between 17 and 20.[17]

Finally the mothers completed the *General Health Questionnaire* (GHQ).[18] The questionnaire is focused on four components of psychiatric morbidity (somatic symptoms, anxiety and insomnia, social dysfunction and depression). Thirty questions of a Likert format are used with scores above 20 indicating psychiatric morbidity.

The questionnaires were scored as outlined above. All the data were entered into the computer and subjected to *Fisher's Exact Probability Test* and multiple regression analysis.

RESULTS

Sixty children all in their seventh year of life, thirty of whom were female, took part in the study. All of their mothers took part and were interviewed. The modal social class was IIIM and NM.

Child dental anxiety status

The range of scores for dental anxiety, for the children, were from 0 to 8 with a mean score of 1.32 (±2.44).

The scores for dental anxiety were then cross-tabulated with:

Demographic factors

There was no significant association between dental anxiety status and gender of the child (P=0.27) or socioeconomic status of the father (P=0.24).

Dental factors

There were statistically significant associations of dental anxiety status with irregularity of dental attendance (P=0.003), and previous reported disruptive behavior in the dental situation (P<0.001).

Maternal factors

The mother's dental anxiety status (P<0.001), the length of time since the mother's last dental visit (P=0.02), her regularity of dental attendance (P=0.05) and her dislike of fillings (P=0.008) were all significantly related to child dental anxiety status.

The mothers' GHQ scores ranged from 7 to 42 with a mean of 18.75 (± 8.28). A significant association was demonstrated between GHQ score and child dental anxiety status (P<0.001).

Developmental factors

Significant associations with child dental anxiety status could be demonstrated for eating problems, problems with bowel and bladder control, disruptive sleeping habits, problems in relating to peers/siblings, dependency on mother, temper tantrums, moods, worries and fears (Table 1).

Those factors that had been demonstrated to be significantly associated with child dental anxiety status were then used as independent variables and entered into a stepwise regression analysis with child dental anxiety status as the dependent variable.

All sixty data sets were used in the regression analysis. It demonstrated that child dental anxiety could be explained by the following variables: previous disruptive behavior at the dentist, frequent moods of irritability and depression, irregular dental attendance of the child, eating problems, including food fads, poor bowel and bladder control, fears of everyday objects, mother's dental anxiety, and her irregularity in dental attendance (Table 2). This model explained 92 percent of the variance.

Table 1 ☐ Association of child dental anxiety with developmental factors.

Developmental behaviors	Child Dental Anxiety: Low dental anxiety status (n=51) percent	High dental anxiety status (n=9) percent	P
Eating problem	37.2	100	<0.001
Poor bladder and bowel control	1.9	55.6	<0.001
Sleeping problems	11.7	88.9	<0.001
Abnormally high activity	33.3	66.7	0.065
Poor concentration	19.6	33.3	0.908
Problems in relating to siblings/peers	7.8	66.7	<0.001
Increased dependency on parents	5.9	77.8	<0.001
Management problems	9.8	22.2	0.938
Frequent temper tantrums	3.9	55.6	<0.001
Frequent moods of irritability and depression	5.9	66.7	<0.001
Worries more than normal	5.9	77.8	<0.001
Fears of everyday objects	15.6	88.9	<0.001

Table 2 ☐ Prediction of child dental anxiety status.

Explanatory variables	β parameter estimate	(S.E.)	t	p
Reported previous negative behavior at the dentist	1.02	(0.13)	7.25	<0.001
Frequent moods of irritability and depression	2.36	(0.33)	7.20	<0.001
Irregular dental attendance of the child	−2.23	(0.44)	−5.10	<0.001
Eating problems	0.75	(0.17)	4.49	<0.001
Poor bladder and bowel control	1.65	(0.38)	4.30	<0.001
Fears of everyday objects	1.06	(0.25)	4.23	<0.001
Mother's dental anxiety	0.08	(0.03)	2.73	<0.01
Irregular dental attendance of the mother	−0.41	(0.16)	−2.64	<0.05

$F=7.39$; $df=1,8$; $n=60$; $R^2=0.92$; $P<0.001$

DISCUSSION

The purpose of this study was to examine factors that could identify dental anxiety in a randomly selected group of six-year-old children. The factors examined included psychological development of the child, maternal dental anxiety and mental health status, the socioeconomic background and gender of the child, the child's previous dental experiences, together with the mother's dental health behaviors.

The prevalence of dental anxiety in the children was 15 percent, comparing favorably with other studies that considered dental fear in young children.[19] With respect to gender and socioeconomic background, no differences in dental anxiety status could be demonstrated. Furthermore their previous experience of unpleasant dental treatments, including emergency general anesthesia for extractions, could not differentiate between the fearful and nonfearful children.

When the mother was closely questioned on her child's reaction to their most recent dental experience, however, it emerged that those children who were most fearful had more reported disruptive behaviors during dental treatment, compared with others. It also emerged that neither the mothers nor their children attend the dentist for six-month visits. These findings suggested that other factors were salient with regard to dental anxiety in this sample of children and their mothers.

Two factors pertinent in this regard, are maternal dental anxiety status and maternal psychiatric morbidity. Both of these were closely related to child dental anxiety status. Furthermore it was in those children, with high dental anxiety scores, that normal psychological development was delayed. Their mothers reported that the children had food fads, nocturnal enuresis, disturbed sleep, difficulty in leaving them, increased sibling rivalry, mood swings, and phobic reactions to everyday situations and objects. This suggested that these children had not yet entered the latency period, although chronologically they were the same age as the other children.

In an attempt to show how all of these associated factors could help in understanding child dental anxiety, a stepwise regression analysis was conducted. It showed that the most important explanatory variables were reported disruptive behaviors at the most recent dental visit, then the psychological developmental variables, and finally maternal factors illustrating the complex nature of child dental anxiety.

Is the reported disruptive behavior a manifestation of the child's underlying psychological development, which in turn has been affected by the mother's ability to cope with dental treatment? The results from the cross-tabulation analysis would support this premise. It seems that a complex interaction exists, in which the role of the mother plays a central part, influencing both the child's degree of psychological development, on the one hand, and the child's ability to cope with dental treatment, on the other.

These findings are important for dentists, since there is the need to be able to assess those children who are of special need with regard to their dental anxiety status. This pilot study used randomly selected children in a community setting, in order to assess dental anxiety status. It demonstrates that the child's ability to cope with dental treatment (as reflected in reported disruptive behavior) is based upon his/her degree of psychological development, together with the mother's fear of dental treatment. Such factors as these should be considered by dentists when assessing dental anxiety in their child patients, in order to assist and help the frightened child cope with dental care.

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NEONATAL MAXILLONASAL HYPOPLASIA AND VITAMIN K

This review demonstrates that vitamin K deficiency may affect many human pregnancies. The interference with the production of extrahepatic vitamin K-dependent proteins during the first trimester results in neonatal maxillonasal hypoplasia of varying degrees. The resultant disfigurement can be very troublesome to the individual and correct counselling regarding the cause and recurrence risk is important. It appears that many such affected patients may receive their only professional advice regarding their appearance from their general dentist or dental specialist. It is important that members of the dental profession appreciate the possible non-genetic causes of this condition.

The question of vitamin K supplementation during pregnancy is difficult to resolve as recent studies have related neonatal vitamin K supplementation with a small increase in the risk of childhood cancer. These studies, together with the demonstration that sister chromatid exchange in foetal blood is increased by vitamin K in a concentration-dependent manner, indicate that there might also be detrimental effects of too much vitamin K during embryonic development.

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Hypnosis as an adjunct to the administration of local anesthetic in pediatric patients

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Behavior management is critical to the success of pediatric dental procedures. Many techniques have been described for managing child behavior in the dental office, including both pharmacologic and nonpharmacologic methods.

Nonpharmacologic methods have included modeling, distraction, and hypnosis. These techniques are effective in reducing the pain and anxiety associated with dental procedures. It has been found that both hypnotic and nonhypnotic methods significantly reduced pain perception in pediatric patients during medical procedures.[1-3] One study found that the nonhypnotic approach did not significantly relieve anxiety, which was reduced only via hypnosis. Investigating this phenomenon further, the study cited the distinguishing feature between the hypnotic and nonhypnotic methods as the *intense imaginative involvement* during hypnosis. Children tended to become involved in novel and intriguing imaginative situations, and their attention was diverted from the painful medical procedure.[3] This suggests that children's attention can be held and sustained through the use of imagination and fantasy. The technique for hypnosis alters the state of consciousness by narrowing the patient's field of attention to one idea through intense imaginative involvement.

Siegel and Peterson found that preschool children taught such coping skills as relaxation, pleasant imagery, and calming self-talk, all similar to hypnosis, demonstrated significantly less distress in the dental office setting than a nontaught control group.[4] In another study, children receiving instruction in relaxation and positive self-talk (i.e. calming thoughts, positive reappraisals, and self reinforcement) exhibited fewer stress-related behaviors during dental procedures than children in control and nontreatment groups.[5]

The purpose of this study was to ascertain the acceptance of local anesthetic injection, using hypnosis in children.

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METHODS AND MATERIALS

Twenty-nine children (eleven boys and eighteen girls) between the ages of four and thirteen years participated in the study. Each child had no previous dental experience, had American Society of Anesthesiologists Classification I (ASA 1) medical histories, and spoke English as a first language.[6] Each needed at least two restorative appointments. A brief explanation of the study, and the hypnotic procedure itself was given to the parents and an informed consent was obtained. Parents and children were informed that they could end their participation in the study at any time, without affecting their child's treatment in the clinic.

The subjects were videotaped during administration of local anesthetic. A double blind research design was used to avoid the effects of expectancy. Each subject was evaluated twice, once utilizing hypnosis before injection, and once without. The same dentist administered the local anesthetic for all patients, always in the same isolated operatory (quiet room). This same dentist, certified by the Society of Clinical and Experimental Hypnosis, also performed the hypnotic suggestion at the appropriate visit.

Upon presentation to the clinic, each experimental subject was seated in a semisupine position in the dental chair. The flip of a coin determined whether or not hypnosis was used at that appointment. The second appointment included hypnosis, if it was not utilized at the first appointment. Each subject was monitored with a transcutaneous pulse oximeter and readings were taken at baseline (before hypnotic suggestion or any other procedure) and at tissue penetration on administration of local anesthetic. If a visit included hypnosis, the hypnotic suggestion was carried out before proceeding with topical and local anesthesia. All experimental subjects were asked to close their eyes before receiving the anesthetic.

Videotaping was begun as each subject received topical anesthetic (5 percent Xylocaine ointment) for two minutes at the injection site. Following the application of the topical anesthetic, the patient received 1.8 cc 2 percent Xylocaine (maxillary infiltration or inferior alveolar block) via a 27-gauge, disposable needle. After the completion of the injection, the operatory chair was raised to an upright position and videotaping was discontinued. The videotapes showed only the anesthetic procedure, and included no indication of whether or not the subject had received hypnosis. As necessary, the patient was brought out of the hypnotic state before any operative procedure was initiated.

The hypnotic procedure was accomplished in the operatory by instructing the patient to take deep breaths through the nose, to relax, and to concentrate on their favorite visual imagery or sensations. Stories or adventures were individually tailored with personal content, and were elaborated with direct, indirect, and ego-strengthening suggestions to create absorbing and pleasant experiences.[5]

The videotapes were reviewed independently by two pediatric dentists without knowledge of the patients' hypnotic conditions. They rated the patients' behavior using the North Carolina Behavior Rating Scale (NCBRS), noting the presence of high hand movements, leg movements, crying or verbal protests, and/or orophysical resistance.[7] Their findings, as well as the transcutaneous pulse oximetry data, were statistically analyzed.

Statistical methods

The response variables, pulse rates and oxygen levels, were analyzed using multivariate analysis of variance (MANOVA). The paired observations on each subject were contrasted, hypnotic condition versus nonhypnotic condition. The dependent variables were thus the change in the response variable from baseline to local. The test for a significant difference between the two changes and any relationship to gender, race, age, or the ordering of the conditions was made using MANOVA ($\alpha = .05$). The NCBRS response variables were first coded to collapse the ratings by the two blind observers. At each rating period the four types of responses (high hand movement, leg movement, crying or verbal protest, and/or orophysical resistance) were coded as positive if either rater indicated that the behavior was present. The paired ratings, hypnotic condition versus nonhypnotic condition, were compared for marginal homogeneity using McNemar's test ($\alpha = .05$).

RESULTS

Table 1 shows that the twenty-nine subjects were predominantly white females. Ages ranged from 4.5 to 13.5 years. Eighteen females and eleven males, five blacks and twenty-four whites were included in the study. The number of patients receiving hypnosis at the first visit was fourteen, while fifteen received hypnosis at their second visits.

There were three dependent variables: change in oxygen level, change in pulse rate, and behavioral rat-

Table 1 ☐ Description of subjects (N = 29).

Variable		N	Percentage
Gender	Female	18	62.1%
	Male	11	37.9%
Race	Black	5	17.2%
	White	24	82.8%
Order	Hypothesis first	14	48.3%
	Hypothesis second	15	51.7%
Age	mean		7.8 yrs.
	standard deviation		2.1 yrs.

Table 2 ☐ Average and standard deviation pulse rate and oxygen level under each hypnotic condition.

	Baseline		At injection		
Condition	Mean	Std. dev	Mean	Std. dev	Change
		Pulse rate			
Hypnosis	99.31	14.88	95.41	18.19	−3.90
No hypnosis	93.55	15.77	103.93	15.98	10.38*
		Oxygen level			
Hypnosis	98.79	1.21	97.97	1.66	−0.83
No hypnosis	98.66	1.54	98.86	1.22	0.21

*Significant change, $p < .05$

Figure 1

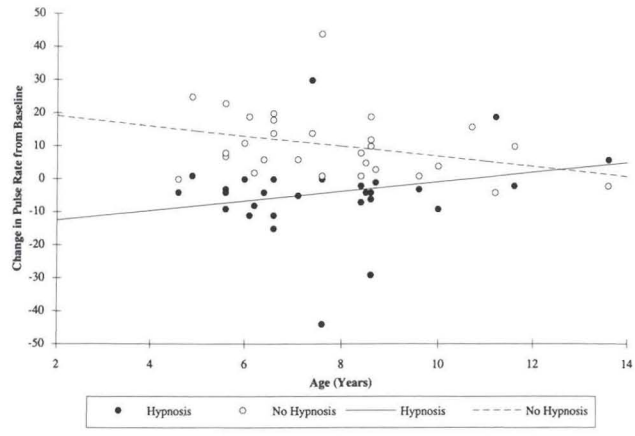

Table 3 ☐ Behavioral ratings under the hypnosis and no hypnosis condition. (p-value for test of marginal homogeneity).

		Hypnosis		
No hypnosis		no Crying	Crying	%
no Crying		16	1	58.6%
Crying		8	4	41.4%
	%	82.8%	17.2%	(p = .0196)
		no Physical	Physical	%
no Physical		22	1	79.3%
Physical		6	0	20.7%
	%	96.6%	3.4%	(p = .0588)
		no Hands	Hands	%
no Hands		23	0	79.3%
Hands		5	1	20.7%
	%	96.6%	3.4%	(p = .1025)
		no Legs	Legs	%
no Legs		22	1	79.3%
Legs		4	2	20.7%
	%	89.7%	10.3%	(p = .1797)

ing. Change was measured from baseline to the time the local injection was given. Table 2 shows the average and standard deviation of oxygen level and pulse rate under the hypnotic condition. The change from baseline to injection is also noted. The MANOVA of tissue oxygen saturation showed no differences attributable to the hypnotic condition, order of treatment, sex, race, or age. There were significant differences in pulse rate attributable to the hypnosis condition ($F(1,24) = 9.7$, $p < .0047$) and age ($F(1,24) = 6.1$, $p < .0210$) but not to sex, race nor order of treatment ($p > .15$). Table 2 shows the magnitude of the change. It indicated that after hypnosis, pulse rates went down by approximately 4 bpm, whereas without hypnosis, the pulse rate increased by over 10 bpm. The relationship with age is shown in Figure 1. The vertical axis indicates the difference between the baseline and injection pulse rates after hypnosis versus after no hypnosis. Points in the upper portion of the graph generally had an increase in pulse rate without hypnosis, whereas points below the zero mark had an increase in pulse rate after hypnosis. The effect of hypnosis is more pronounced with younger children (i.e. ages four to six). The single age-seven subject at the top of the graph, if removed from the study, would not have changed the significance of the effects reported here.

The two observers' behavioral ratings were combined into a single rating for the analysis of behavior under the two hypnotic conditions. The percentage agreement between the two raters was high (crying 93 percent, hands 96.5 percent, physical 89.7 percent, legs 98.3 percent). McNemar's test was used to test whether the proportion positive under the two conditions was the same. In each of the four rating categories the trend was toward less negative behavior (eg. less crying) under the hypnotic condition than under the nonhypnotic condition. Only crying, however, was significantly different ($p < .02$). Table 3 shows the number of subjects in each of the behavioral categories under the hypnotic and nonhypnotic conditions. It indicates that in twenty-nine subjects, eight subjects cried while not under hypnosis but did not cry under hypnosis. Only one of twenty-nine subjects cried after hypnosis and did not cry after no hypnosis. The 41.4 percent

crying without hypnosis and 17.2 percent crying with hypnosis is significantly different. A larger sample size would likely have indicated that the other behavioral ratings were significantly different.

DISCUSSION

Oxygen saturation remained unchanged in both experimental groups. This was expected, as none of the procedures used affected the airway or the patient's respiratory effort, and no oxygen supplementation was introduced.

Statistically significant differences in pulse rate attributable to the hypnosis condition were noted. Pulse rate decreased at the time of injection in hypnotized subjects by 4 bpm, while it increased at this point in nonhypnotized patients by 10 bpm. This is attributable to the hypnotized patient's relaxed state, their attention being successfully held, even during the physical stimulation of injection. The nonhypnotized patients, whose attention was not directed, reacted as expected to the minor discomfort of injection.

The effect of hypnosis on the factors examined was more pronounced in younger children (four to six years of age). This is consistent with other studies on hypnosis, which note that younger children are more susceptible to hypnotic suggestion.[3] It is suggested that this is due to younger children's ability for curiosity and intense imaginative involvement in the hypnotic suggestion.

Behavior ratings showed statistically significant differences between hypnotic and nonhypnotic patients. Patients in which hypnosis was used demonstrated fewer undesirable behaviors (i.e. crying, hand movement, physical resistance, leg movement) than those who did not undergo hypnosis. Decreased crying with hypnosis was the only behavior found to be statistically significant. Interrater reliability was high, so this difference is not attributable to discrepancies between raters. With a larger patient sample, the other factors examined may also be found to be statistically significant, as the general trend was noted in this relatively small sample. This area is worthy of further investigation, as it has a direct influence on the delivery of clinical care. It would also be of interest to study hypnotic and nonhypnotic patients' responses to other invasive dental procedures; similar benefits may be found.

In summary, hypnosis can have a positive impact on pediatric patients for injection of a local anesthetic. The hypnosis procedure does require some adjustments in office routine and time management. A relatively quiet environment is needed to capture effectively and to maintain the child's attention. In busy offices without an isolated treatment area, this could be difficult. The time involved in introducing the hypnotic suggestion to the patient must also be considered and, although relatively brief, does represent an additional time commitment to the patient.

CONCLUSIONS

Hypnosis can have a positive impact on pediatric patients for injection of local anesthetics. Specifically, crying and pulse rate were found be significantly decreased when hypnosis was utilized. This may provide a viable adjunct to the administration of local anesthetics in children.

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Comparison of the sedative effectiveness of two pharmacological regimens

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For some patients, a visit to the dentist elicits negative feelings generated by previous unpleasant experiences or by fear of the dental procedure to be completed by the professional. These feelings, poorly controlled by some of the developmentally disabled patients become behavior problems difficult to overcome.

Sedative premedications are usually prescribed to control uncooperative behavior and to promote a more receptive attitude toward treatment in these patients. Pharmacologic methods such as conscious sedation, deep sedation, or general anesthesia are utilized in those cases. In 1985 the American Academy of Pediatric Dentistry defined conscious sedation as follows: *A minimally depressed level of consciousness that retains the patient's ability to maintain a patent airway independently and continuously and respond appropriately to physical stimulation and/or verbal command.*[1]

At the Monroe Developmental Center (MDC), different pharmacological regimens are prescribed to help resident patients cope with the tensions generated during dental treatments. Our purpose in this study was to evaluate in a clinical setting the degree of effectiveness of two of these orally administered regimens:

- ☐ The combination of chloral hydrate and diazepam.
- ☐ The combination of chloral hydrate and diphenhydramine HCl.

Chloral hydrate is a sedative that is rapidly absorbed after oral administration. Its onset of action occurs within thirty to sixty minutes and the effects last four to eight hours.[2,3] It is rapidly metabolized to trichloroethanol and acts as a CNS depressant. Its mechanism of action is not completely understood. The usual premedication dosage is 25 to 50 mg/Kg taken orally thirty to forty-five minutes before dental treatment. Although doses generally should not exceed 2,000mg, there have been reports of doses as high as 3,000mg in children undergoing ocular examinations.[4] Chloral hydrate may cause hypotension, gastric irritation, and nausea.[2,3] Rarely, erythematous and urticarial allergic reactions have been reported.[2,3]

Houpt and co-workers (1985) reported the results of a study utilizing two different doses of chloral hydrate; 75 mg/Kg and 50 mg/Kg of body weight.[5] They found the dose of 75 mg/Kg gave better results. The administration of this sedation did not affect the vital signs and no other adverse effects were detected during its use. They mention that a transitory elevation of the pulse, inversely proportional to the dose, occurred during mouth-prop insertion or local anesthetic administration, but that it disappeared as soon as the stimulus was discontinued.

The study was conducted in the Department of Pediatric Dentistry, Eastman Dental Center, Rochester, NY 14620. Dr. Davila is Professor, Department of Pediatric Dentistry.

Diazepam, a benzodiazepine, has many uses, some of which include relief of anxiety, sedation, and skeletal muscle relaxation.[2,3] Diazepam is rapidly absorbed orally with an onset of action within thirty to forty-five minutes.[3] Its effect is mediated through the inhibitory neurotransmitter gamma-aminobutyric acid (GABA).[2,3] Desmethyldiazepam, the major metabolite of diazepam, is about equally active as diazepam.[2] Diazepam may cause hypotension, dizziness, ataxia, and disorientation.[2,3] Paradoxically, agitation and excitement may occur.[2,3] Rarely hepatic disease and blood dyscrasias have been reported.[2]

In February 1990, *Pediatric Dentistry* published the results of a study completed by Bedalaty, Houpt, and co-workers, comparing the sedative effects of a diazepam solution of 0.3 mg/Kg or 0.6 mg/Kg of body weight plus 50 percent nitrous oxide/oxygen with a combination of chloral hydrate 50 mg/Kg plus 50 percent nitrous oxide/oxygen in children (33.5 months, mean age; and 31.5 pounds, mean weight).[6] The rating scale for movement described by Houpt in 1985 was used in their evaluations.[5] Because of its practicality, this table was also used in the present study (Table 1).

Table 1 ☐ Rating scale for movement.
(Houpt & co-workers, 1985)

1. Violent movement interrupting treatment	
2. Continuous movement, making treatment difficult	
3. Controllable movement that does not interfere with procedure	
4. No movement	

Table 2 ☐ Rating scale for sedation.
(Davila and Co-workers, 1991)

A—Complete sedation:	Operative procedures, extractions, radiographs, sub-gingival scaling
B—Partial sedation:	Only tooth brushing, charting, and/or polishing, possibly some radiographs
C—Poor sedation:	Visual examination only
D—No sedation:	No treatment or examination
E—Paradoxical effect:	Patient was excited

Note: Because there were no cases of paradoxical reactions, classification "E" regarding quality of sedation has been removed from the tables.

According to Badalaty and co-authors, there was limited movement in all groups and no statistically significant difference among the study groups was evident. Sedation was considered successful *even if there is some movement or crying but the treatment is completed.* Ninety-three percent of the 0.6 mg/Kg diazepam solution and 73 percent of the 0.3 mg/Kg diazepam solution were rated as *good, very good,* or *excellent,* compared to only 60 percent of the chloral hydrate sedation, which was rated similarly.

In a previous study, Davila and co-workers reported the results of a retrospective evaluation of the sedative effectiveness of a per-os combination of chloral hydrate and diazepam in a group of thirty-five individuals. All the patients received the drug combination forty-five minutes before their dental appointment. The degree of sedation achieved was evaluated, utilizing a scale based on the amount of work accomplished during the appointment (Table 2).

Diphenhydramine HCl is an antihistamine with anticholinergic and sedative properties. Some of its uses include the treatment of allergic reactions, insomnia, motion sickness, and Parkinsonism. It is well absorbed following oral administration with an onset of action within fifteen to thirty minutes.

Diphenhydramine may cause dry mouth, dizziness, and epigastric distress. Rarely urticaria, drug rash, and anaphylactic shock have been reported.[3]

The combination of diphenhydramine and chloral hydrate is utilized frequently at Monroe Developmental Center and other institutions for the developmentally disabled patient as a sedative combination with positive results.

Sams, Thornton, and Wright published in 1992 the results of their study comparing two oral sedative regimens in children.[8] The average age and weight for all their study participants were thirty-nine months and thirty-two pounds. The combinations were chloral hydrate/promethazine and meperidine/promethazine, plus nitrous oxide/oxygen. The average drug dosages used were 53.3 mg/Kg chloral hydrate (range 50 mg/Kg—69 mg/Kg), with 1 mg/Kg of promethazine, and 1 mg/Kg of meperidine (range 0.5 mg/Kg—1.5 mg/Kg) with 1 mg/Kg promethazine. Administration of the medications was by mouth.[8]

Nitrous oxide/oxygen and local anesthetic were used in conjunction with the sedative regimens. Concentrations of nitrous oxide/oxygen varied from 30 percent to 70 percent, with 73 percent of the cases being 50 percent nitrous oxide and 50 percent oxygen. Lidocaine 2 percent, 1:100,000 epinephrine was used for local anesthesia.[8]

Effectiveness of sedation was evaluated by Sams and co-authors with a modification of the scoring system reported by Barker and Nisbet in 1973. According to Sams *et al,* emesis occurred in 5 percent of the cases, while oxygen desaturation was documented in almost half the cases. There was no statistical difference be-

tween the two sedative regimens in regard to sedation or to the prevalence of hypoxemia, which occurred in 48 percent of the patients receiving chloral hydrate/promethazine and 50 percent in those receiving meperidine/promethazine.[8]

It is important to mention the reluctance of some professionals to use chloral hydrate because of its demonstrated carcinogenic properties after prolonged administration in mice. Steinberg studied the pharmacologic, metabolic, toxicologic, medical and epidemiologic information available on chloral hydrate and trichloroethylene, which metabolizes into chloral hydrate, and concluded that the potential risk to humans could not be predicted directly from rodent data, because it was "especially difficult to extrapolate from chronic rodent administration to intermittent human administration".[9]

Steinberg expressed concern that the substitution of other drugs in place of chloral hydrate could be as dangerous or even worse.[9] He stressed the need to focus efforts on minimizing toxicity and maximizing efficiency. This challenge has been met by the present study, where low doses of medication were used and dental procedures were completed.

MATERIALS AND METHODS

Study sample

After being approved by both the Institutional Review Boards for Studies Involving Human Subjects of the Monroe Developmental Center and the Eastman Dental Center in Rochester, New York, this study was conducted at the Dental Clinic at Monroe Developmental Center.

The study included twenty-six patients who reside at Monroe Developmental Center (MDC) in Rochester, New York. All patients were in need of dental treatment and, due to difficult behavior, sedative medications before dental treatment were needed.

All patients were mentally retarded and more than seventeen years of age (Table 3). Written informed consent was obtained by the principal investigator from the parents, legal guardian, or consent committee of the institution after a complete description of the study, including it's purpose, methods, risks, and potential benefits, was provided. Written consent was also obtained from the primary-care physician before each dental treatment during the study. The parents or legal guardian were assured they could withdraw consent at any time during the study, and that patient identity would remain confidential. Patients were excluded from the study, if the attending physician did not consider it appropriate for them to receive either of the two premedication regimens, if they suffered from hepatic or renal impairment, respiratory disturbances, or hypotension; or if they were allergic to chloral hydrate, diphenhydramine, or diazepam.

Table 3 ☐ Study population.

26 Patients — 52 Appointments	
Age range:	25 - 70 years
Mean age:	35 years
Degree of mental retardation:	
Moderate:	1
Severe:	3
Profound:	22
Gender:	22 Males
	4 Females
Weight range:	41 to 90 kg
Mean weight:	58 kg

Study design

A randomized, double-blind, cross-over study design was used. Patients were assigned to one of two treatment groups: A or B. Patients in group A received chloral hydrate syrup, 30 mg/Kg orally, and diphenhydramine, 1.5 mg/Kg orally, not to exceed 2,000 mg and 75 mg, respectively (regimen BLUE). Patients in group B received chloral hydrate syrup, 30 mg/Kg orally, and diazepam solution, 0.2 mg/Kg orally, not to exceed 2,000 mg and 10 mg, respectively (regimen RED). After completing one dental treatment in either group A or B, each patient was moved over to the opposite group and received the corresponding premedication before their next dental treatment.

Since the premedication dosages were based on total body weight, the investigating pharmacist calculated and measured all premedication dosages for the study participants. Body weights needed for the calculations were obtained from the patients' medical charts by the investigating pharmacist, five days before the dental treatment. Color and taste differences between the two premedication combinations were minimized with the addition of red dye and cherry flavoring by the investigating pharmacist.

Starting at midnight (12:00 AM) on the day of the scheduled dental treatment, patients were NPO except for their regularly ordered medications. All patients

participating in the study received their premedication regimen forty-five minutes before their dental treatment. If the patient vomited or expectorated part or all of the premedication, the appointment was rescheduled.

Immediately before administration of premedication, vital signs (heart rate, blood pressure, and respiration rate) were recorded. If the blood pressure was less than 90/60 before administration, the premedication regimen was not administered and the dental treatment was rescheduled.

Dental treatment started forty-five minutes after administration of premedication administration by the same dentist, for all patients participating in the study. Also, the dentist was blinded as to which premedication regimen had been administered. Similar dental procedures were performed on each patient during their two appointments, in the same dental operatory at Monroe Developmental Center, and at approximately the same time of the morning. Vital signs were monitored at the dental office and recorded every ten minutes and were monitored every thirty minutes for two hours after dental treatment.

Sedation assessment procedure

The degree of sedation under each of two different sedation regimens was assessed by the dentist (principal investigator) utilizing two scales: A 5-point scale employed in a previous study and reported by Davila *et al*, Table 2, and a 4-point scale reported by Houpt and co-workers in 1985, Table 1.[5,7] The first scale is based on the amount of work accomplished during the dental appointment and the second is a rating scale for movement.

All parameters employed in this study, both explanatory and response variables, were measured on an ordinal categorical scale. Accordingly, relationships between pairs of parameters were quantitatively summarized via the calculations of Kendall's Tau-b.[10] Multivariate interrelationships among parameters were investigated by fitting of log-linear models.[11] Finally the issue of relative efficacy of the two regimens was addressed via a chi-square test employed as a component of the method of analysis given in Koch *et al*, which was appropriate for the repeated-measures data obtained in this study.[12]

Risks

The risks anticipated with the study were primarily associated with the sedative medication. Chloral hydrate, diphenhydramine, and diazepam all have the potential side effects previously mentioned, but they were minimized by monitoring blood pressure and heart rate before, during, and after the dental procedure and by close supervision of patients' health condition by their primary care physicians.

RESULTS

Evaluation of vital signs utilizing the Wilcoxon tests showed significant differences for pulse rate. There were lower pulse rate values among patients with the highest score on the sedation scale (Table 4).

Regarding the relationship between sedation and movement scores, Kendall's Tau-b statistics were used to demonstrate a significant relationship between movement and sedation. There was less movement in patients who achieved better sedation (Table 4).

Table 4 ☐ Results: Movement and vital signs scores.

Number of patients	Movement		Blood pressure		Pulse		Oxygen saturation		Respiration rate	
	R	B	R	B	R	B	R	B	R	B
			Same sedation and movement							
8	1.75	1.75	123/75	126/77	87	93	96	97	19	19
			Same sedation only							
7	3.0	2.1	129/75	127/78	88	84	99	96	19	20
			Same movement only							
2	2.0	2.0	119/72	122/74	80	86	98	98	18	21
			Different sedation and movement							
9	2.6	1.45	129/74	122/71	90	81	97	97	19	20

R – Red Code B – Blue Code
Figures represent mean values

Eight patients had the same sedation and movement ratings with both pharmacologic regimens. Seven patients had the same sedation scores only. Two patients had the same movement scores, but different sedation scores with the two sedative combinations. Nine patients achieved different degrees of sedation and movement (Table 5).

Among the eleven subjects receiving different sedation scores, ten attained a greater level of sedation using the RED regimen (Statistically significant $p < 0.05$, McNemar's Test). Among the fifteen subjects receiving different movement scores, 13 (87 percent) received better scores with the RED regimen suggesting a statistically significant advantage with that sedation ($p < 0.05$, McNemar's Test). One subject refused treatment under the BLUE regimen (Table 5).

Table 5. ☐ Results: sedation scores

Degree of sedation	Same sedation Same movement		Same sedation only		Same movement only		Different sed & mov	
	R	B	R	B	R	B	R	B
A	2	2	2	2	1	1	7	1
B	1	1	4	4	–	1	1	3
C	4	4	1	*	–	–	1	3
D	1	1	–	–	1	–	–	2
Number of patients	8		7		2		9	

R – Red code B – Blue code
* - Patient refused treatment

Both regimens demonstrated a relationship between the dosages of diazepam and diphenhydramine HCl and the level of sedation. No such relationship was present with chloral hydrate, the highest levels of which produced both the best and the worst cases. No relationship between movement and either regimen or drug dosage was evident (Table 5).

No relationship was evident between weight and level of sedation for either regimen. For subjects receiving the RED regimen, there was a relationship between weight and the level of movement. No such relationship existed for subjects receiving the BLUE regimen.

DISCUSSION

To define what a good, partial, or poor sedation is and to determine the effectiveness of a sedative medication is a difficult problem for the clinical researcher. There are no clear parameters; what is a good sedation for one professional could be considered a partial or poor sedation by another. Each patient reacts differently to the same medication and the same subject may react differently from one day to the next. Experience and empathy also play an important role in the field of dentistry for the disabled, perhaps more than in any other dental specialty.

In this study the amount of work completed and the intensity of patient movement were arbitrarily accepted as parameters for the evaluation of sedation. Based on the premise that the environment, techniques of patient management, and similarity between visits are important factors, every effort was made to minimize differences. The same office, professional team, and monitoring systems were used, and the type of procedures performed were kept as similar as possible within the treatment plan for each patient.

All subjects were residents of Monroe Developmental Center, a New York State run facility for the mentally retarded and developmentally disabled. They received the sedative medications from a staff nurse under the supervision of the investigating pharmacist.

The dentist was not aware of the dosage or combination of drugs the patient received. Vital signs were rigorously monitored. Each patient was seen twice, once under the sedative effect of the regimen named RED and once under the effect of the sedative called BLUE. It was a cross-over, double-blind study.

The sedative combinations tested in the study were:

Regimen RED: Diazepam 0.2 mg/Kg body weight plus chloral hydrate 30 mg/Kg body weight to a maximum dose of diazepam 10mg and chloral hydrate 2000mg. *Regimen BLUE*: Diphenhydramine HCl 1.5 mg/Kg body weight plus chloral hydrate 30 mg/Kg body weight to a maximum dose of 75mg diphenhydramine HCl plus 2000mg chloral hydrate.

The medications were not given in the same order: seventeen patients received the BLUE regimen for their first appointment and nine received the RED regimen first. The doses were calculated by the investigating pharmacist based on up-dated body weight information.

The diazepam-chloral hydrate combination was selected based on the results of a retroactive study completed by Davila and co-workers in 1980. The diphenhydramine HCl-chloral hydrate combination was tested because of its frequent use in institutions such as Monroe Developmental Center.

The results of the present study demonstrate:

☐ A significant relationship between movement and type of sedation (Kendall's Tau-b Statistics).

- ☐ That vital signs were not negatively affected by either regimen.
- ☐ That the RED regimen was a better sedative combination, statistically significant at a level of $p < 0.05$ (McNemar's Test).
- ☐ That of the 87 percent of subjects receiving different movement scores, better sedation scores were achieved with the RED regimen.

CONCLUSIONS

- ☐ Two pharmacologic combinations were tested in this study: regimen RED and regimen BLUE. Both were effective and safe at the dose employed.
- ☐ Vital signs were not negatively affected by either of the sedation regimens used.
- ☐ The combination of diazepam/chloral hydrate (regimen RED) was statistically better than the diphenhydramine HCl/chloral hydrate (BLUE) combination.
- ☐ This study demonstrates that it is possible to maintain a low-dose range of sedative medication and still get satisfactory results.
- ☐ Proper management of the patient, maintenance of a pleasant environment, and an awareness that the patient keeps all their faculties in a limited or dulled, but present, condition under conscious sedation allow the dentist to complete many dental procedures.

Further study of other new sedative agents and other combinations is important. Our hope is that the results of this study will be useful in the pharmacologic management of the difficult dental patient.

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VIOLENCE IN THE US FAMILY

Violence in the US family has come unleashed. The proof is in the numbers. Although the statistics are somewhat inconsistent, it appears that when victims of abuse are sorted-out as children, women and spouses, or the elderly, each of the three groups may contain as many as 2.5 million individuals. These figures are tragic: their yearly increase is appalling. Nationally, for example, reports of domestic elder abuse have doubled from 1986 to 1991. And, here in Illinois, the trend of increased cases of abuse and neglect is no less apparent. In 1989, the Department of Children and Family Services received reports of 102,257 suspected victims of child abuse and only three years later the number soared to 130,556.

If you are thinking that this is society's problem and not dentistry's, think again. The majority of injuries inflicted during domestic violence occur in the head and neck area and are visible to those of us providing dental care. Our profession's responsibilities in intervening on behalf of the patient/victim of violence are clearly spelled-out, both legally and ethically.

Scholle, R.G.: Rescuing the victims of domestic violence: A disturbing selectivity. Review, 87:68, July 1994.

DENTAL SERVICES

Dentists' perceptions of the variety of dental services provided for children

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Previous studies describing dental care provided for children have demonstrated differences in general dentists and pediatric dentists regarding radiographic examination, caries detection, and recommendations for restorative treatment.[1-4] Pediatric dentists recommended exposing more diagnostic radiographs, restoration of smaller interproximal lesions, and more stainless steel crowns than did general dentists.[1,2,4,5] Practitioner differences in behavior management procedures and the methods of payment accepted for treatment were also noted.[6,7] Pediatric dentists reported more frequent use of oral sedation, general anesthesia, and physical restraint than did general dentists.[6] Pediatric dentists reported accepting Medicaid as payment for services more frequently than general dentists.[7]

To examine further these apparent differences in providing dental care for children, the purpose of this project was to describe the variety of dental services provided to children by general dentists and pediatric dentists.

METHOD

A survey that contained questions pertaining to the practice of dentistry for children was mailed once to 2000 general dentists and 1000 pediatric dentists. The names and addresses of the dentists were obtained through the American Dental Association Data Processing Service to provide a national random sample of member and nonmember dentists. This method has been employed for previous surveys seeking information pertaining to children's dental services.[1,4,6]

This manuscript will be limited to the data describing the scope of the services provided by general dentists and pediatric dentists. Chi-square statistical analysis was employed to compare the percentage distribution of respondents for each dental service.

RESULTS

There were 1064 of 3000 (36 percent) usable responses, including 662 general dentists (33 percent) and 492 pediatric dentists (49 percent). The examination and parental consultation services are reported in Table 1. All respondents reported providing initial comprehensive and recall examinations. The pediatric dentist respondents reported obtaining informed consent more frequently (83 percent) than did the general dentists (75 percent) ($p<0.001$). Significantly more pediatric dentists (93 percent) reported conducting parent/child conferences than did general dentists (88 percent) ($p<0.012$).

The preventive services are described in Table 2. Ninety-seven percent of each practice type reported providing topical fluoride treatments. The pediatric dentist respondents reported a higher frequency of oc-

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Table 1 ☐ Percent of respondents reporting, providing examination/consultation services.

Service	General dentists	Pediatric dentists	X^2	P-Value
Comprehensive exam	100	100		NS
Recall exam	100	100		NS
Informed consent	75	83	11	<0.001
Patient/Parent conference	88	93	6	<0.012

Table 2 ☐ Percent of respondents reporting, providing preventive services.

Service	General dentists	Pediatric dentists	X^2	P-Value
Topical fluoride	97	97		NS
Occlusal sealant	94	99	17	<0.001

Table 3 ☐ Percentage of respondents reporting sealant treatment of various occlusal surfaces by condition.

Condition of occlusal surface	General dentists	Pediatric dentists	X^2	P-Value
Deep pits and fissures	95	95		NS
Well-Coalesced	28	28		NS
Incipient caries	53	43	9	<0.002

Table 4 ☐ Percentage of respondents providing restorative services.

Service	General dentists	Pediatric dentists	X^2	P-Value
Preventive resin	81	90	19	<0.001
Class I amalgam	98	96		NS
Class II amalgam	97	95		NS
Class I composite	86	91	7	<0.01
Class II composite	65	67		NS
Strip crown	21	73	302	<0.0001
Stainless steel crown	81	98	83	<0.001
Pulpotomy	90	99	35	<0.001

Table 5 ☐ Percentage of respondents providing various orthodontic services.

Service	General dentists	Pediatric dentists	X^2	P-Value
Referral only	52	3	380	p<0.0001
Limited treatment	42	91	290	p<0.0001
Limited and comprehensive treatment	10	51	228	p<0.001

clusal sealant utilization (99 percent) than did the general dentists (94 percent) ($p<0.001$). Sealant treatment for various occlusal surface conditions is reported in Table 3. Ninety-five percent of those practitioners using sealants reported placing sealants on occlusal surfaces with deep pits and fissures. Only 28 percent of each group reported sealing occlusal surfaces with well coalesced pits and fissures. The general dentists reported employing occlusal sealants for the treatment of incipient occlusal carious lesions significantly more frequently (53 percent) than did the pediatric dentist respondents (43 percent) ($p<.002$).

The restorative procedures are reported in Table 4. There were no significant differences in the provision of class I or class II amalgam restorations or class II composite restorations by practice type. Compared to general dentists, the pediatric dentist respondents more frequently reported providing preventive resin restorations (90 percent, 81 percent) ($p<0.001$), class I composite restorations (91 percent, 86 percent) ($p<0.01$), strip crowns (73 percent, 21 percent) ($p<0.0001$), stainless steel crowns (98 percent, 81 percent) ($p<0.001$) and pulpotomy procedures (99 percent, 90 percent) ($p<0.001$).

The reported provision of orthodontic services is described in Table 5. Fifty-two percent of general dentists but only 3 percent of the pediatric dentists reported providing only referral orthodontic services ($p<0.0001$). Ninety-one percent of pediatric dentists compared to 42 percent of general dentists reported providing limited orthodontic treatment ($p<0.0001$). Fifty-one percent of the pediatric dentists and 10 percent of the general dentists reported providing comprehensive orthodontic treatment ($p<0.001$).

DISCUSSION

The results of this survey reveal significant differences in the dental services reported to be provided for children by general dentists and pediatric dentists. The responding pediatric dentists more frequently reported that they conduct patient/parent conferences than did the general dentists. This suggests that pediatric dentists are more likely to include patient and parent education and recognize the importance of the dentist's rapport with the parent as an integral component in the provision of a child's dental care. The fact that pediatric dentists more frequently report obtaining informed consent may relate to their recognition of the importance of the relationship among the parent, child, and health care provider. In addition, a previous survey demonstrated that pediatric dentists employed aversion and sedation behavior management procedures more frequently than did general dentists.[6] These behavior management procedures require explanation and discussion by the dentist, because they are likely to be perceived negatively by parents.[8] Pediatric den-

tists also more frequently report providing orthodontic treatment than do general dentists (Table 5). Collectively these findings suggest that because pediatric dentists provide more services that may be viewed negatively by parents, they may be more aware of the importance of obtaining informed consent.

In agreement with these data, previous surveys have reported higher utilization and greater value attributed to sealants by pediatric dentists than by general dentists.[9,10] The fact that the general dentists reported more frequently sealing incipient occlusal caries than did the pediatric dentists is somewhat surprising. The pediatric dentists reported more frequently providing preventive resin restorations, however, than did general dentists, suggesting a practitioner type difference in the approach to treating incipient occlusal caries.

The fact that pediatric dentists reported more frequently employing strip crowns, stainless steel crowns, and pulpotomy procedures is not surprising, in view of their additional training and familiarity with restoring children's teeth. A previous survey has also demonstrated that pediatric dentists are more likely than general dentists to recommend stainless steel crowns for the restoration of an interproximal carious lesion in primary molars.[4] Another study has shown that pediatric dentists report treating younger children and perceive the children they treat to have more severe dental caries than children treated by general dentists.[11] These differences in education and experience along with the perceived differences in patient age and caries severity may explain the differences in the children's restorative services provided by the two groups of practitioners. The fact that pediatric dentists report they more frequently provide some type of orthodontic service suggests that their educational background has prepared them to recognize malocclusion in the developmental stage and to initiate corrective measures. The fact that over half of the general dentists provide only referral orthodontic services suggests that the general dentists are not as oriented to the treatment of developing malocclusions as are the pediatric dentists. Half of the pediatric dentists report providing comprehensive orthodontic treatment, which illustrates the pediatric dentists' interest in this type of service and their desire to provide comprehensive care for the child.

The results of this survey demonstrate that there are differences in the perceptions of the general and pediatric dentists regarding the variety of dental services they provide for children. These perceived differences in services provided support the general dentists' and pediatric dentists' perceptions that the patient populations they treat are different.[11] These findings reflect differences not only in educational background and philosophy of practice, but also in the patients treated by each group of practitioners. One of the key questions that remains to be answered is how close the dentists' perceptions are to their actual practices.

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DEMOGRAPHICS

Mom is out working: Who is taking care of the kids?

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

My mother was a housewife. (The "politically correct" term "homemaker" was as yet not in use, nor indeed was "P.C." itself in the vernacular.) My mother was there to see me off to school in the morning and was at home when I came back for lunch (in the years when I was in grade school). In the afternoon, the milk and cookies were ready for me when I returned at about 3 PM. In the evening my father returned from work. My sister and I sat in the kitchen with our parents and ate the meal my mother had cooked. We were very much like every other family in our neighborhood.

But all of that happened a half a century ago in another time, maybe in another world. In our nation today, the mothers of more than 30 million children are employed, (57 percent of all children less than fifteen years of age) including more than nine million children less than five years of age.[1] (Note: throughout this presentation, based on the Bureau of the Census procedures and reports, in the case of married couple families the wife is designated as the reference person for child care purposes.[1])

The need and/or desire of millions of mothers for careers with financial remuneration is but one component of the overall evolving family structure, the demands for women's rights and equality, and any number of other developments that are affecting dramatically the traditional perspectives of our society. For example, the historical image of younger and middle age women volunteering their assistance for a number of community service organizations in many instances, has had to be replaced by legions of older early and traditionally retired men and women.

A previous presentation in the *Journal of Dentistry for Children* emphasized the point that, "there is no such thing as a typical family."[2]

- ☐ Relatively fewer of us are living in family households, particularly in "traditional" nuclear families, than did in the early years of this century.
- ☐ Women in this country are bearing fewer children and they are doing so later in their reproductive years.
- ☐ Those who live in family households (still a substantial majority of the population) live in less stable, more heterogeneous families than did previous generations.
- ☐ Regardless of the presence of children (even infants) women are more likely to work outside the home than to work solely as homemakers.[2]

"...more than half of all children are likely to experience a period of living with a single parent during the 1990s, usually in reduced economic circumstances."[3]

Dental practitioners, particularly pediatric dentists, have had to deal with the reality that mom may not be available to shepherd her little "darling" for any number of needed services (if in fact there is a woman in the family grouping). As practitioners attempt to modify practice arrangements to accommodate the dramatic changes in family and work arrangements, they will need to take into consideration the reality that a

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youngster's home environment may be quite different from that with which many "older" practitioners can identify. (The child care arrangements faced by 1) the increasing numbers of female dentists and 2) the increasing numbers of male dentists married to employed wives, surely are part of the total picture of child care problems faced by the general public.)

The need is to provide practitioners with a broad appreciation of the environment within which increasing numbers of children are being reared. The following presentation can serve only as an introduction to this complex and growing system of child care for which a total of $21 billion were spent annually in the late 1980s.[1] In the early 1990s, there are 39,000 nonschool based organized child care facilities (with payrolls) that have 405,000 employees.[4] (Note: the National Association for Education of Young Children recommends for child care programs that there be at least one adult for every four infants, one adult for every six two-year-olds, and one adult for every ten preschoolers.[5])

SOURCE OF INFORMATION

For the most part, data were drawn from the extended and indepth report by the Bureau of the Census on its Survey of Income and Program Participation (SIPP). The 1988 SIPP survey (with the results published in mid 1992) represents one of the latest in a series of efforts by the Bureau to document the economic situation of households and individuals throughout the country. Each selected household in the SIPP stratified random sample is scheduled to be interviewed at four-month intervals.

WHO IS WATCHING THE KIDS?

"Most mothers can't afford to stay home. And many can barely afford to work."[5]

Preschool children

Although the news media has tended to emphasize group care centers, nurseries, and formal preschool arrangements, in 1991, 36 percent of children (less than five years of age) of working mothers were cared for in the child's home with an additional 31 percent cared for in another person's home (Table 1). In the late 1980s, for employed mothers, 73 percent of children less than three years of age were cared for in their own home or in the home of another person.[1]

Table 1 ☐ Day care arrangements for the children of working mothers: 1988, 1991.[1,4]

	Under age 5 (1991)	Ages 5–14 (1988)
Total number (in 000s)	9,854	20,804
Arrangements		
Child's home	35.7%*	11.9%
Another's home	31.0	4.0
Day/group care center	15.8	1.7
Nursery school/preschool	7.3	0.8
Kindergarten/grade school	0.5	75.5
Child cares for self	—	2.3
Mother cares for child at work	8.7	2.1
Totals	100%	100%

*Includes, father 20%, grandparent 7.2%, other relatives 3.2%, nonrelative 5.4%

Table 2 ☐ Primary child care arrangements used by employed mothers for children under 5 years of age: 1977, 1985, 1991.[4]

	1977	1985	1991
Number of children (in millions)	4.4	8.2	9.9
	Percent distribution		
Care in child's home	33.9%	31.0%	35.7%
Care in another home	40.7	37.0	31.0
Organized child care facility	13.0	23.1	23.0
Mother cares for child at work*	11.0	8.1	8.7

*Includes mothers working at home or away from home
Note: Data for 1977 are for two youngest children.
Data for other years are for three youngest children.

But there have been changes. Since the mid 1970s, while the number of children of employed mothers has more than doubled, there has been a decrease in the percent of children cared for in another person's home (from 41 percent to 31 percent) with a corresponding increase in the percent cared for in organized child care facilities (from 13 percent to 23 percent) (Table 2). Other changes include:

- ☐ There was a decline in the use of relatives for child care services (possibly associated with the increase in the labor force participation of women outside of the home).
- ☐ There was a decline in the proportion of children cared for by their mothers while at work.[4]

Grade school children

Fifteen million seven hundred thousand of the total 20.8 million grade school children were in school while their mothers were employed. But the hours in school did not necessarily coincide with all the hours worked by their mothers. In most instances, when the children were not in school, care was provided by fathers, other relatives, and various after school arrangements. Al-

most a half million children were left unsupervised most of the time that their mothers worked, however, and they were not in school (Table 1).

During mother's working hours when children were not in school, more younger grade school children, (ages six to eleven) compared to older grade school children, were cared for in their own home or in the home of another person. Older grade school children increasingly were left on their own (Table 3).

WORKING CONDITIONS AND CHILD CARE

Not all employed mothers work traditional nine-to-five day-shifts. Many women are employed during evening and night periods. Whereas the younger children (less than five years) of day-shift workers were cared for primarily in the home of another person or in an organized care facility, the children of nonday-shift workers were cared for primarily in the child's home or in that of someone else (Table 4).

FAMILY INCOME AND CHILD CARE

In 1988 the average weekly cost of child care was $54 with higher income families spending an average of $75. "... full costs for quality care usually runs between $3,000 and $9,000 (annually) ... (with an additional $1,000 to $2,000 in the Northeast region of the country)."[5] Other writers indicate that there is a direct relation between increased family income and the use of organized child care facilities (Table 5). For lower income families, the cost of child care represented one fifth of total family income (Table 6).

"Child care centers often try to minimize expenses by setting low wages, typically less than $10,000 a year (in 1988). But the low wages go hand in hand with high turnover."[5]

DEMOGRAPHICS AND CHILD CARE

There are differences in the use of the many types of informal and organized child care arrangements based on different demographic characteristics, including:

- ☐ A greater percent of African-American children, than white children, are in organized care arrangements.
- ☐ A greater percent of children in married families with a spouse present are cared for "at work" (note: may include working in a home setting).
- ☐ A greater percent of children reared by mothers with less education and lower income are cared for at home (Table 7).

FROM THE DENTIST'S PERSPECTIVE

"Taking a patient's history in today's world must move beyond the 'usual' dental, medical and social factors."[2]

Our concern in the care of youngsters must go be-

Table 3 ☐ Primary care arrangements excluding child's time in school: 1988.[1]

	Age	
	6–11 yrs	12–14 yrs
Care in child's home	27.2%	18.5%
Care in another home	16.2	6.2
Organized child care facility	5.0	0.3
School based activity	3.7	2.4
Child care for self	4.1	14.5
No care mentioned	40.3	55.5
Mother cares for child at work	3.4	2.7
Totals	100%	100%

Table 4 ☐ Child care arrangements for children less than 5 years by shift work of employed mothers: 1988.[1]

	Day-shift	Nonday-shift
Care in child's home	21%	41%
Care in another home	41	30
Organized child care facility	30	19
Other arrangements	8	10
Totals	100%	100%

Table 5 ☐ Children less than 5 years in organized child care facilities by family income and poverty status: 1988.[1]

Family monthly income	Day/group care	Nursery/pre-school	Totals
<$1,500	15%	5%	20%
$1,500-$2,999	16	8	24
$3,000-$4,499	18	11	29
$4,500 +	18	13	31
Below poverty level	13	8	21
Above poverty level	17	9	26

Table 6 ☐ Average weekly cost of child care and percent of family income spent on child care: 1988.[1]

	Average weekly cost	Percent of income
<$1,500	$42	18%
$1,500-$2,999	46	9
$3,000-$4,499	55	6
$4,500 +	75	5
Average	54	
Below poverty level	42	21
Above poverty level	55	7

Table 7 ☐ Primary care arrangements for children less than 5 years whose mothers are employed: 1988.[1]

	Child's home	Another's home	Organized care arrangement	Mother cares for child at work*
Race				
White	28.7%	36.5%	26.5%	8.3%
African-Amer.	23.1	40.2	33.7	3.0
Hispanic				
Hispanic	26.4	40.9	24.5	8.2
Nonhispanic	28.4	36.4	27.3	7.5
Marital status				
Married spouse present	28.2	36.2	26.9	8.7
Other arrangements	28.2	39.4	30.0	2.4
Education				
< Highschool graduate	31.7	38.2	21.9	8.2
Some college +	26.7	33.7	33.5	6.1
Poverty level				
Below	32.9	33.9	22.0	11.2
Above	27.8	37.0	28.0	7.2

*Includes mothers who are employed at home.

yond the unavailability of parents for a dental visit, or increased attention to the set of follow-up home care instructions. We are dealing with a generation of children that is being reared in an entirely different environment from that of preceding generations. It should be noted, however, that, the fact that many of our mothers were there with "cookies and milk," (while many of today's children are "latchkey kids") did not in itself guarantee that we had a particularly favorable upbringing.

And so does it really matter that you and I were reared in different home environments as compared to that of our children and grandchildren? While the long term consequences of these developments may be uncertain, the reality is that the children being reared in the 1990s and beyond will experience different learning environments, which dental practitioners in general and pediatric dentists in particular will need to recognize. Fewer youngsters are being reared in the isolation of their own homes. The socialization process is beginning earlier and in a variety of ways that could be used by the pediatric dentist to facilitate the care of the more difficult patients.

Many men may yearn for the "good old days", when women were out of the competitive market place and remained at home to cook, clean, and rear their children. The reality is that in our present world in many households, the kids carry their own door keys, and often learn the ways of other families and mix with children of different races, ethnicities, and cultures long before similar exposure by their parents.

My mother's cooking has been replaced by the microwave that warms up the prepackaged and precooked food. The milk and cookies that were waiting on the table now come in rectangular boxes (with neatly covered straws attached) and fruit bars. The kitchen table has been replaced by a snack table in front of the TV. And you think that this has no effect on your next patient? (Thanks Mom!)

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Children in rural areas: Extending the horizons of pediatric dental practice

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

WHERE DO PEDIATRIC DENTISTS PRACTICE?

"...male and female pediatric dentists tend to be found in or around large cities... Fewer women pediatric dentists tend to practice in rural sites."[1]

"Fewer pediatric dentists select rural sites or small cities, yet these sites often are unfluoridated and have at-risk populations."[1]

The conclusion of earlier writings in the *Journal of Dentistry for Children* was that there were favorable opportunities for pediatric dentists in nonurban areas, resulting from "...reduced numbers of dentists per population, a large backlog of needed services for children and an increasing demand for dental care..."[2]

ON SELECTING THE LOCATION FOR A DENTAL PRACTICE

"The decision to locate a dental practice ... is based upon a highly complex series of personal, family, cultural, economic and a seemingly infinite series of other interrelated variables."[3]

The realities are that residents of nonmetropolitan areas, compared to their metropolitan counterparts, reported a smaller percent with a dental visit in the previous year, fewer dental visits per person (except for central parts of metropolitan statistical areas) and lower rates of dental insurance.[4] Child and adult residents in nonurban areas have been increasing their use of dental services, however, and in some cases surpassing their metropolitan counterparts (Tables 1 and 2).

The fact that nonurban residents are increasing their use of dental services would not in itself attract practitioner interest, if the general perception was that the rural population of our country was continuing to decrease as increasing numbers of people are concentrated in our large urban communities. For example, since the first years of this century, the urban residents of the nation increased from 40 percent to 73 percent of the general population (Figure and Table 3).

While it is true that the farm population of our nation decreased during this same period from almost 30 million people (39 percent of the population) to less than five million people (less than 2 percent of the population) the number of nonfarm rural residents increased by almost four hundred percent (from 16 to 63 million people). Nonfarm rural residents now constitute one

Table 1 ☐ Percent of the general population with a dental visit and the number of visits per person in the past year by place of residence: 1980, 1989.[5,6]

	Percent with visit		Visits per person	
	1980	1989	1980	1989
Metropolitan statistical area	51.9%	58.4%	1.8	2.2
Nonmetropolitan statistical area	45.5	53.2	1.4	2.4

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quarter of the population of the nation (Table 3).*

The following presentation uses recently published Bureau of the Census and Department of Agriculture data in an effort to encourage pediatric dental practitioners to consider the potential for practice in other than traditional urban locations—areas where the residents not only are increasing their use of dental services, but where the population is growing in numbers.

SOURCE OF INFORMATION

The Current Population Study, conducted by the Bureau of the Census, is a continuing national random sample survey of occupied housing units. Each month approximately sixty thousand units are eligible for the survey. Interviewers are unable to obtain interviews at about 3,600 of these units, because the occupants are not found at home after repeated calls, or are unavailable for other reasons. All data in this presentation, unless otherwise specified, are drawn from this extensive report on the residents of farm and nonfarm rural areas.[7]

* In general, urban populations comprise all persons living in places of 2,500 or more inhabitants incorporated as cities, villages, boroughs, and towns. A population not so classified constitutes a rural population.[7]

Table 2 ☐ Percent of children with a dental visit and the number of visits per person in the past year by place of residence: 1989.[6]

Age	Metropolitan statistical area			Nonmetropolitan statistical area
	Totals	Central	Noncentral	
		Percent with visit		
2-4yrs	39.3%	38.1%	40.0%	32.2%
5-11yrs.	73.9	70.2	76.3	69.7
12-17yrs.	74.0	68.2	77.4	66.2
		Visits per person		
2-4yrs	1.0	0.9	1.0	0.8
5-11yrs.	2.2	1.9	2.4	2.0
12-17yrs.	2.9	2.1	3.4	2.5

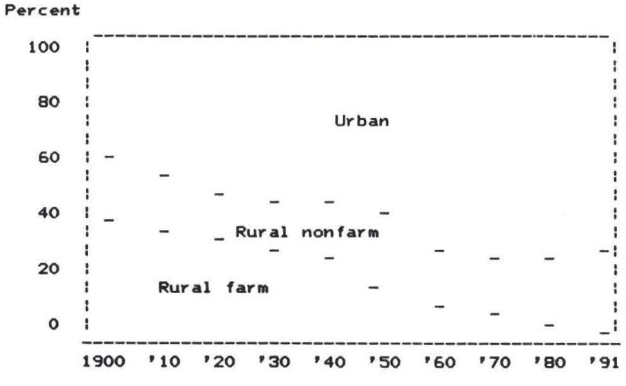

Figure. Percent of the population residing in urban areas and in farm and nonfarm portions of rural areas: 1900-1991.[7]

GENERAL POPULATION DEMOGRAPHICS

The Midwest region has the largest proportion of the population residing on farms (49.3 percent) than any other region in the country. The South has both the largest total number of rural residents (85 million) and highest proportion of its residents living in rural areas (43.6 percent) than the other regions.

Race

White persons comprise nearly all of the farm resident population, with Black and other races representing less than three percent of the total. Almost 20 percent of the 180 million residents of urban areas are members of the various racial minority populations, compared to 8.5 percent of nonfarm rural residents and 2.6 percent of farm residents (Table 4).

Ethnicity

The Hispanic population accounts for 11 percent of ur-

Table 3 ☐ Population by residence: 1900, 1991.[7]

	Number		Percent	
	1900	1991	1900	1991
	(in millions)			
Urban	30.2	180.7	39.6%	72.6%
Rural	45.9	67.9	60.4	27.3
Farm	29.8	4.6	39.1	1.8
Nonfarm	16.2	63.3	21.2	25.4
Totals	76.2	248.7	100%	100%

Table 4 ☐ Population residence by race and Hispanic origin: 1991.[7]

	White	Black	Other races	Hispanic*	Totals
		Number (in millions)			
Urban	146.1	26.6	8.1	19.8	180.7
Rural					
Farm	4.5	68**	49**	87**	4.6
Nonfarm	57.9	4.2	1.2	1.6	63.3
		Percent			
Urban	80.8%	14.7%	4.5%	11.0	100%
Rural					
Farm	97.5	1.5	1.1	1.9	100%
Nonfarm	91.5	6.6	1.9	2.6	100%

Note: Totals differ due to rounding
*May be of any race
**In thousands

ban residents, 2.6 percent of nonfarm rural residents and 1.9 percent of farm residents (Table 4).

Economics

Compared to nonfarm households,** farm households have:

- ☐ A smaller percent with incomes below $15,000.
- ☐ A smaller percent with incomes below the poverty level.***
- ☐ A higher median income (Table 5).

Education

Educational levels of farm and nonfarm residents vary greatly for men twenty-five years of age and older. Twenty-nine percent of male farm residents, compared to 43 percent of male nonfarm residents have at least some college training. By contrast, 37 percent of female farm and nonfarm residents had some college education.[7]

Employment

Almost two-thirds (64 percent) of the 48.8 million nonfarm rural residents over fifteen years of age are in the labor force (73 percent of males and 56 percent of females), compared to 69 percent of farm residents.

More than one quarter of employed nonfarm rural residents work in technical, sales, and administrative positions. Almost one quarter (23 percent) work as managers and professional specialists, 19 percent as operators, fabricators, and laborers, and 15 percent in precision, production, craft, and repair positions. Less that 4 percent work in farm related occupations, compared to 46 percent of employed farm residents.

Summary

A singular uniform image of a rural population no longer represents the changing realities of nonurban residents. There are major demographic differences between the decreasing farm resident population, the increasing nonfarm resident population, and urban populations.

Table 5 ☐ Income of farm and nonfarm households: 1990.[7]

	Farm	Nonfarm
Less than $5,000	3.0%	5.2%
$5,000-$9,999	5.7	9.8
$10,000-$14,999	9.2	9.5
$15,000-$24,999	18.9	17.7
$25,000-$34,999	18.2	15.7
$35,000-$49,999	19.7	17.4
$50,000-$74,999	15.0	14.9
$75,000-$99,999	5.6	5.4
$100,000 +	4.6	4.3
Totals	100%	100%
Number of households (in millions)	1.6	92.7
Median income	$31,589	$29,901
Percent below poverty level	8.9%	10.7%

Table 6 ☐ Population less than 15 years of age by residence: 1991.[7]

	Number		Totals	
	Male	Female	Number	Percent
	(in millions)			
Urban	20.5	19.7	40.2	72.3
Rural	7.9	7.4	15.4	27.6
Farm	.5	.4	.9	1.6
Nonfarm	7.5	7.0	14.5	26.1
Totals	28.4	27.1	55.6	100%

Note: Totals differ due to rounding

CHILDREN

More than 15 million children less than 15 years of age (over one quarter of all children) live in rural areas. Of this number, less than one million live on farms (Table 6). While relatively small in number, compared to nonfarm families, farm families with children have slightly more children per family. Almost all children (95 percent) reared in farm families live with two parents, compared to 77 percent for nonfarm children (Table 7).

Cost of rearing children

The Department of Agriculture reported that the average annual cost of rearing a child from birth to eighteen years of age not only increases as the child ages, but it varies in different regions of the nation and in urban and rural nonfarm settings. On average:

- ☐ It costs less to rear a child in both urban and rural nonfarm settings in the Midwest region than in other sections of the nation.
- ☐ It costs less to rear a child in rural nonfarm areas than in urban areas in the Midwest region.
- ☐ In the Northeast and West, it costs more to rear a child in rural nonfarm areas than in urban areas (Table 8).

**A household consists of all persons who occupy a housing unit. A family is a group of two or more persons related by birth, marriage or adoption and residing together.[7]

***The poverty level varies by family size. In 1989, the poverty level for a family of four was $12,675.

Table 7 ☐ Characteristics of farm and nonfarm families: 1991.[7]

	Farm	Nonfarm
Number of families (millions)	1.4	64.9
Percent of families with their own children	38.4%	49.1%
Average number of children per family		
Less than 18 yrs	2.06	1.83
Less than 6 yrs	1.43	1.33
Percent living with two parents	95.0%	76.7%

Table 8 ☐ Average total cost of rearing a child from birth to 18 years of age by region and place of residence: 1989.[8]

Region	Urban	Rural nonfarm
	(in thousands)	
Midwest	$105.5	$97.8
Northeast	110.9	119.0
South	114.5	114.7
West	116.9	122.2

THE POINTS TO BE MADE

In the past there were significant differences between rural and urban family living conditions. Researchers identified several attributes associated with rural living, "...more traditional attitudes about families, higher fertility rates, large households, earlier age of marriage, and out migration of couples of childbearing age."[9]

Today urban and rural families are very similar with regard to family size, age and number of children, type of living arrangements and types of child care arrangements. Yes, there are demographic differences between farm, nonfarm rural, and urban populations. But that is not the only important issue. The more important concern is to provide information about these populations and dispel the image that

- ☐ The numbers of children outside of urban areas is small and decreasing.
- ☐ There are limited opportunities for pediatric dental practice.

Unfortunately available national data provide only a glimpse of the varying nonurban population. But even the limited information should encourage the consideration of a judicious distribution of pediatric dentists to nonurban areas.

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BABY BOTTLE TOOTH DECAY

A study of baby bottle tooth decay and risk factors for 18-month old infants in rural Japan

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Caries status in young children was a severe problem in Japan a few decades ago.[1-4] According to the National Survey of Dental Diseases in Japan, 1963, both the caries prevalence of thirty-six-month old children (87.4 percent) and the average number of decayed teeth per child (3.23) were high.[5] Since 1977 a dental examination was required for eighteen-month-old infants. As a result many studies report that the caries prevalence in infants recently has been reduced.[6-9] Inoue *et al* (1979) showed that the prevalence was 15.1 percent and the average number of decayed teeth per child was 0.47 in eighteen-month-old urban populations.[10] In two studies conducted in the same area in urban Japan in 1976 and 1983, Suzuki *et al* (1983) reported that the prevalence decreased from 18.8 percent to 11.6 percent and the average number of decayed teeth per child was reduced from 0.63 to 0.26.[4] In a similar study, Shimohida *et al* (1986) showed that the prevalence decreased from 18.02 percent to 12.74 percent in rural Japan between 1980 and 1986.[11]

Eighteen months may be an especially important time in the child's physical and psychological development; the identification of problems at eighteen months may help to ameliorate future dental and medical problems. One of the severest dental problems in this age is Baby Bottle Tooth Decay (BBTD), characterized by a distinctive rampant caries pattern in which maxillary incisors and frequently the maxillary and mandibular molars are affected.[12-15] Research has been conducted to identify the prevalence, cause and treatment of the disease. Presently, BBTD is viewed as a result of inappropriate feeding behavior; this viewpoint has been widely accepted. Recently studies have focused on cultural and ethnic differences.[16-21]

In this study, the authors have investigated BBTD and caries risk factors in samples of eighteen-month-old infants in rural Japan communities undergoing routine government sanctioned dental examinations. All communities investigated in this study were nonfluoridated.

METHOD

The subjects were 638 children, who participated at eighteen months in dental health screening in Okay-

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ama Prefecture, Japan. The data were collected at three health centers in Okayama (Oku 111, Tamashima 357, and Yorishima 170 children).

In Okayama, oral examination, caries activity test and dental health guidance were implemented by dentists, hygienists, and health nurses. Oral examinations were conducted by dentists, using dental mouth mirror and explorer. Caries was assessed in accordance with the criteria of Health Policy Bureau, Ministry of Health and Welfare. The criteria consist of five grades (C0-C4) according to severity of caries:

- ☐ C0 = caries with only white lesion without visual decay.
- ☐ C1 = caries in enamel lesion.
- ☐ C2 = caries in dentine lesion.
- ☐ C3 = caries with perforation to pulp.
- ☐ C4 = caries with existence of root only (without crown).

The "Cariostat" was used as a caries activity test. Caries activity is assessed by collecting plaque that is removed from buccal surfaces of maxillary teeth with cotton swabs. After collecting a plaque, the swab is put into the Cariostat medium and then incubated at 37 degrees centigrade for forty-eight hours. After the incubation, seven grades of colorimetric change are estimated, using a color standard sample. Each of these colors is evaluated as follows:

- ☐ Blue (pH7.0) = 0.
- ☐ Green (pH5.4) = 1.
- ☐ Green-yellow (pH4.4) = 2.
- ☐ Yellow (pH4.0) = 3.

Intervals between criteria (0-1, 1-2 and 2-3) are divided into halves.[22,23]

Parents completed dental health questionnaires, which included a series of questions regarding the children's daily habits, focusing on behavioral risk factors for dental diseases. The questions are as follows:

- ☐ Q1. Has your child been weaned from the breast?
- ☐ Q2. Does your child use the nursing bottle?
- ☐ Q3. Do you have a set time for snacks?
- ☐ Q4. How often does your child eat something between meals?
- ☐ Q5. Do you brush your child's teeth at bedtime?
- ☐ Q6. Does your child snack while playing?

The authors collected the data in the three health centers and utilized the following statistical analysis methods: Pearson correlation analyses were performed to examine the relationship between caries status and responses to each question. Secondly, because inappropriate feeding at eighteen months is known to result in severe tooth decay, subjects were divided into two groups to responses to Q1 "Has your child been weaned from the breast?" and Q2 "Does your child use the nursing bottle?". Chi-square test and a two-tailed t-test were used to evaluate the differences between two groups. A p-value below 0.05 was considered significant. In addition, we utilized discriminant analysis to examine the risk factors for caries status and caries activity. Discriminant analysis is a statistical technique in which linear combinations of variables are used to distinguish between two or more categories of cases.[24]

RESULTS

Table 1 presents the overall caries status and the Cariostat average score of the subjects. Caries prevalence was 13.7 percent, ranging from 3.6 percent to 18.3 percent. The average number of carious teeth per child (dft) was 0.27. The Cariostat average score was 1.54 (S.D. = 0.66).

The overall responses to behavioral risk-factor questions are presented in Table 2. Fourteen percent of subjects were not weaned from the breast at eighteen months and 19.8 percent continue to use the nursing bottle. About one third of subjects did not have a set time for snacks and ate something between meals; about one half snacked while playing. Regarding brushing behavior, about a third reported that they did not brush their children's teeth at bedtime.

Table 1 ☐ Results of caries status and Cariostat.

Variable	X	S.D.
Caries experience		
Caries prevalence (%)	13.7	----
dft (average per child)	0.27	1.13
decayed (average per child)	0.23	1.01
filled (average per child)	0.04	0.43
Cariostat average score	1.54	0.66

Table 2 ☐ Responses to questions.

Question	Response	%
1. Has your child been weaned from the breast?	Yes	86.0
	No	14.0
2. Does your child use the nursing bottle?	No	80.2
	Yes	19.8
3. Do you have a set time for snack?	Yes	63.7
	No	36.3
4. How often does your child eat something between meals in a day?	≤ 2times	67.2
	3 times<	32.8
5. Do you brush your child's teeth before going to bed?	Yes	63.9
	No	36.1
6. Does your child have snack while playing?	No	47.9
	Yes	52.1

Table 3 ☐ Correlation between caries status and questions.

	dft	caries	Cariostat	Q1	Q2	Q3	Q4	Q5	Q6
dft	--	.81**	.19**	.20**	.00	.20**	.13*	.11	.04
caries	--	--	.20**	.09*	.10**	.15**	.07	.02	.07
Cariostat	--	--	--	.12**	.04	.10**	.03	.09*	.11**

Caries means "whether the child is caries-free or not".
* $p<0.05$, ** $p<0.01$

Table 3 presents the correlation between caries status, the Cariostat score, and each question. The Cariostat score was significantly related to dft score ($r = .19$, $p = .002$) and whether or not the child was caries-free ($r = .20$, $p = .000$). The questions about breast feeding (Q1) and eating a snack regularly (Q3) correlated strongly with dft score, "carious or noncarious" and the Cariostat score (in order, Q1; $r = .20$, $r = .09$, $r = .12$, Q3; $r = .20$, $r = .15$, $r = .10$, all $p < .01$). The question about using the nursing bottle (Q2) correlated significantly, however, only with "carious or noncarious" ($r = .10$, $p < .01$).

Comparisons between those weaned/not from the breast and bottle are presented in Tables 4 and 5. The "have not weaned yet from breast" group had significantly higher dft than the "have already weaned" group. The "have not weaned yet" group had approximately twice the prevalence of caries than the "have already weaned" group (21.3 percent vs. 12.4 percent). A similar result was found for the Cariostat score. Regarding other questions, the "have already weaned" group had tendencies to report more desirable answers to dental health questions than the "have not weaned yet" group, although there were no statistically significant differences between the two groups (Table 4). No differences were found for caries prevalence + Cariostat score between stopped using/not yet stopped groups. The "stopped using a bottle" group reported desirable answers at a much higher rate than the "not yet stopped" group for all questions. For example, 50.0 percent of the "using a bottle" group reported eating a snack regularly in comparison with 67.1 percent of the "stopped using a bottle" (Table 5).

Table 6 presents the results of investigating breast

Table 4 ☐ Comparison of caries status and questions according to Q1 "whether the child has been weaned or not".

Variable	have weaned	not yet weaned	Test statistics
dft	0.17	0.77	$t = -2.08$*
caries prevalence	12.4%	21.3%	$x^2 = 5.19$*
Cariostat score	1.51	1.72	$t = -2.60$*
Q3 (eat snack regularly)	65.1%	55.1%	$x^2 = 3.37$*
Q4 (less than 2 times)	68.1%	61.8%	$x^2 = 1.36$
Q5 (brush child's teeth)	64.4%	60.7%	$x^2 = 0.46$
Q6 (not eat while playing)	48.9%	41.6%	$x^2 = 1.65$

* $p<0.05$, ** $p<0.01$

Table 5 ☐ Comparison of caries status and questions according to Q2 "whether the child continues using a bottle or not".

Variable	stop using	not yet stopped	Test statistics
dft	0.27	0.25	$t = 0.13$
caries prevalence	13.5%	14.3%	$x^2 = 0.05$
Cariostat score	1.52	1.60	$t = -1.11$
Q3 (eat snack regularly)	67.1%	50.0%	$x^2 = 12.82$**
Q4 (less than 2 times)	69.1%	59.5%	$x^2 = 4.19$*
Q5 (brush child's teeth)	66.5%	53.2%	$x^2 = 7.82$**
Q6 (not eat while playing)	50.7%	36.5%	$x^2 = 8.14$**

* $p<0.05$, ** $p<0.01$

Table 6 ☐ Comparison of caries status according to Q1 "whether the child has been weaned or not" and Q2 "whether the child continues using a bottle".

	Stopped using a bottle			Using a bottle		
Variable	have weaned	not yet weaned	Test statistics	have weaned	not yet weaned	Test statistics
number of children	439	72		109	17	
caries prevalence	12.1%	22.2%	$x^2 = 4.62$*	13.8%	17.6%	$x^2 = 0.03$
Cariostat score	1.49	1.69	$t = -2.13$*	1.56	1.85	$t = -1.70$
dft	0.15	0.89	$t = -2.07$*	0.23	0.36	$t = -0.35$
Q3 (eat snack regularly)	68.8%	56.9%	$x^2 = 3.93$*	50.5%	47.1%	$x^2 = 0.07$
Q4 (less than 2 times)	69.9%	63.9%	$x^2 = 1.06$	60.1%	47.1%	$x^2 = 0.35$
Q5 (brush child's teeth)	67.0%	63.9%	$x^2 = 0.26$	54.1%	47.1%	$x^2 = 0.30$
Q6 (not eat while playing)	51.7%	44.4%	$x^2 = 1.31$	37.6%	29.4%	$x^2 = 0.43$

* $p<0.05$, ** $p<0.01$

feeding and bottle use together. For children who stopped using a bottle, the "have not weaned" group had significantly higher caries prevalence than the "have already weaned" group (22.2 percent vs. 12.1 percent). Similarly, significant differences were found regarding Cariostat score (1.69 vs 1.49) and the number of dft (0.89 vs 0.15). For children who were using a bottle, results were not significantly different for weaned + not yet weaned groups.

Table 7 presents the results of the discriminant analysis. "Carious or noncarious" and the Cariostat score were used as grouping variables. Six questions were used as discriminant variables. The combination of all variables significantly discriminated for "carious or noncarious" (the canonical correlation coefficient = 0.162, $p < 0.000$). "Weaning" and "setting a time for snack" contributed significantly to "carious or noncarious" (canonical discriminant functional coefficients of 0.483 and 0.847, $p < 0.000$). For the Cariostat score analysis, the coefficient of 0.195 ($p < 0.000$) was obtained. "Weaning" (the coefficient of 0.723), "brush child's teeth" (0.289) and "eating a snack on playing" (0.582) were significant (all $p < 0.000$). Other variables did not discriminate separately.

Tables 8 and 9 show classification results from the discriminant analysis. The combination of all variables correctly classified 59.97 percent of "carious or noncarious" and 62.38 percent of the Cariostat score.

Table 7 ☐ Results of discriminant analysis using caries status and Cariostat score as a discriminant variable.

Variable	carious or non-carious*	Cariostat score**
Q1. weaning	0.483	0.723
Q2. using a nursing bottle	---	---
Q3. setting a time for snack	0.847	---
Q4. frequency of eating snack	---	---
Q5. brush child's teeth	---	0.289
Q6. eating snack while playing	---	0.582

* This analysis had a Wilks' lambda of 0.972, a canonical correlation coefficient of 0.167 and p value of 0.000.
** This analysis had a Wilks' lambda of 0.962, a canonical correlation coefficient of 0.195 and p value of 0.000.

Table 8 ☐ Classification results according to caries status.

	Predicted group	
Actual group	non carious	carious
non-carious (N = 550)	326 (59.3%)	224 (40.7%)
carious (N = 87)	31 (35.6%)	56 (64.4%)

The overall classification rate was 60.0%.

Table 9 ☐ Classification results according to Cariostat score.

	Predicted group	
Actual group	low risk	high risk
low risk (N = 412)	307 (74.5%)	105 (25.5%)
high risk (N = 225)	134 (59.6%)	91 (40.4%)

The overall classification rate was 62.4%.

DISCUSSION

The prevalence of infant caries increases with age; the increase is especially rapid from eighteen months to thirty-six months. According to the latest report of the Ministry of Health and Welfare in Japan, the prevalence of thirty-six-month-old infants with caries was 66.7 percent, almost five times as high as the prevalence of eighteen-month-olds.[25] This finding suggests the importance and necessity of identifying risk factors for dental health for these young children.

The caries prevalence in rural Okayama was 13.7 percent and the average number of carious teeth per child was 0.27. Early studies in the same area reported higher rates of disease. Sudo (1977) reported that the caries prevalence of eighteen-month old children was 19.1 percent in Okayama.[26] Ueda *et al* (1981) reported that the prevalence was 19.5 percent for twelve-month-olds in Okayama.[27] In comparison with these results, it may be that caries in infants has been reduced in Okayama, rural Japan, as other studies reported.[6-9]

The behavioral questions asked about feeding, snacking and brushing behaviors. Concerning feeding behaviors, Inoue *et al* (1981) reported the percentage of Japanese mothers that have not weaned from breast feeding at eighteen months was 4.1 percent.[10] Uchida *et al* (1985) found the percent was 3.8 percent.[28] Our finding of 14 percent in rural Japan is higher than previous reports. The percentage of those who continue to use nursing bottle, however, was almost the same as found in other reports.[29,30]

Our finding of a high rate of breast feeding at eighteen months is likely to have been caused by the encouragement of local Okayama pediatricians. While breast feeding presents immunological, nutritional, and psychological advantages, the prolonged breast feeding seems to be related to dental diseases.[4-31] Weaning from breast feeding had strong correlations with both caries status and Cariostat score. Moreover, when comparing the influence of breast feeding and bottle use, breast feeding was more significant for caries status, especially when children did not use a bottle. This finding may occur when children are exposed for a long time to breast feeding without use of a bottle. In such cases,

children may also have access to repeated cariogenic snacks. From these results, it can be concluded that prolonged breast feeding for eighteen-month-olds enhances the occurrence of dental caries and the increase of caries activity. Some researchers have stated that 12 to 18 months is an appropriate age for breast weaning.[32-33] The authors usually instruct that breast weaning should be completed by twelve months. The validity of this instruction is supported by our findings. Our results suggested that the regularity of snacking may have been another important factor at this age. In the present research, the data regarding contents of snacks could not be obtained. Infants, however, usually ingest the same sweet snacks their older brothers and sisters eat. The sugar intake in the early stage of life may accelerate an accumulation of *S.mutans* in the infant's mouth; it appears to be a risk factor for dental caries, as Johnsen *et al* (1989) have stated.[34] Consequently, it would be helpful to explain to pediatricians the potential problems of both breast feeding and ingestion of cariogenic snacks, and to have the child's dentition examined at an early age.

The Cariostat score showed high correlations between dft and "carious or noncarious". These findings agree with previous research and support the validity and reliability for this caries activity test.[7,35-38] Moreover, correlations between caries status and behavioral risk questions were found. These results are also supported by previous investigations that have reported that dental caries results from various risk factors and are related to habits of daily life.[39-47]

The responses to whether infants use nursing bottle did not result in significant correlations between caries status and the Cariostat score. Infants who were using a bottle, however, had riskier behavioral patterns: snacking irregularly, snacking more than three times per one day, no brushing, and snacking while playing. These findings suggest that improper bottle-use behavior is part of a life style problem. We must recognize improper bottle use not as a simple problem behavior, but as one of a number of problematic life-style-related behaviors.

Through discriminant analysis, the combination of six questions was able to discriminate and classify whether an infant is carious or noncarious and whether the Cariostat score is high or low. Weaning from breast feeding was the most important single predictor of all factors for the caries status and caries activity. Other important factors were the regularity of snacking, brushing child's teeth and snacking while playing. These questions classified carious or noncarious with an accuracy of 60.0 percent and the Cariostat score with an accuracy of 62.4 percent. It was suggested from this result that these behavioral risk questions were useful for screening high risk infants.

It is recommended that routine screening of high risk infants in rural Japan include questions about weaning and other "risk" behaviors. The Cariostat test, which is low cost as well as relatively effective, also should be utilized.

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ABSTRACTS

Castro, George W.; Houston, Glen; Weyrauch, Curtis: Peripheral odontoma: Report of case and review of literature. J Dent Child, 61:209-213, May-June 1994.

Odontomas generally occur central in bone between the roots of teeth and are usually identified as a result of a radiographic survey. In this case report of a peripheral odontoma, the clinical appearance was a pink, firm, nontender mass located lingual to a mandibular left second primary molar. Radiographs were unremarkable except for the congenitally missing succedaneous toothbud. The gingival mass was excised along with a hard ovoid mass and submitted for microscopic examination. The microscopic diagnosis was odontoma, (compound) peripheral. Similarities to previous reports were presence of a gingival mass and a missing succedaneous toothbud. In this case, the rate of growth was slow, typical of the majority of these tumors. A distinctive feature of this case was that the primary tooth was significantly displaced in a buccal direction, thus lending support to the peripheral origin of the tumor.

Odontoma; Gingival mass; Missing toothbud

Yeatts, Donald E.; Wood, A. Jeffrey; McCarter, W. Jefferson: Fevers in children. J Dent Child, 61:249-254, July-August 1994.

Fever is one common reason that families seek medical or dental attention for a child. The fever reaction is a series of cellular events that begins peripherally and ends centrally with a resetting of the body's temperature set-point. The conditions that lead to the febrile reaction are many and include several oral etiologies. The health professional who initially evaluates the febrile child must use care in determining the cause, the severity, and the management of the patient's condition. In performing this task, one must consider the age of the child, the history of the illness, and the physical appearance of the patient.

Fever; Patient's condition

Reid, James S.; Saunders, William P.; Sharkey, Scott W. et al: An in vitro investigation of microleakage and gap size of glass ionomer/composite resin "sandwich" restorations in primary teeth. J Dent Child, 61:255-259, July-August 1994.

Eighty extracted primary molars were divided into four groups of twenty teeth. Class II cavities were prepared in all teeth with equal numbers of proximal boxes having cavosurface margins either in enamel, or dentin/cementum. Each group was allocated to an *open* or *closed sandwich* technique using glass ionomer as a lining. Following the placement of the composite resin restorations, the gap size measured at the proximal box was greatest for the *closed sandwich* group with the cavosurface margin on enamel (0.203μm) or dentin/cementum (0.174μm). Microleakage scores were measured at the proximal box and were greatest for the closed *sandwich* group with the cavosurface margin on dentin/cementum. The best result was obtained for the *open sandwich* group with the cavosurface margin on enamel.

Glass ionomer; Composite resin; Cavosurface margins; Microleakage; Gap size

Meechan, John G. and Donaldson, David: The intraoral use of EMLA cream in children: A clinical investigation. J Dent Child, 61:260-262, July-August 1994.

The use of 5 percent EMLA (an eutectic mixture of local anesthetics comprised of a mixture of prilocaine and lidocaine) as an intraoral topical anesthetic in children has been assessed in a clinical investigation. In a split-mouth study in twenty children there was no difference in the efficacy of EMLA and 5 percent lidocaine ointment in alleviating the pain of maxillary buccal infiltration injections of local anesthetics. EMLA did not differ significantly from placebo in the changes in pulpal responses of maxillary primary teeth to electrical stimulation before and after application in a double-blind split-mouth study in twenty children.

EMLA; Lidocaine ointment; Infiltration injections

Millward, Alistair; Shaw, Linda; Smith, Anthony: Dental erosion in four-year-old children from differing socioeconomic backgrounds. J Dent Child, 61:263-266, July-August 1994.

Although there is very little epidemiological evidence on the prevalence and severity of erosion in children and adults, there have been recent case reports suggesting that the problem of erosion is increasing. This study describes the use of a simple reproducible erosion index. A total of 178 four-year-old children were assessed; almost half of these children showed signs of erosion. The most common site affected was the palatal surface of the upper incisors with 17 percent of the children examined showing visible dentine for greater than one third of the tooth surface.

When considering the influence of socioeconomic group on the prevalence of erosion, four out of five children examined in the low socioeconomic group showed low levels of erosion, while a much greater prevalence was observed in the higher socioeconomic groups.

Dental erosion; Children; Erosion index

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ABSTRACTS *continued from page 244*

Corkey, Barry and Freeman, Ruth: Predictors of dental anxiety in six year-old children: Findings from a pilot study. J Dent Child, 61:267-271, July-August 1994.

The pilot study reported here is based on interviews with sixty, 6-year-old children randomly selected from a school population (and their mothers), to investigate predictors of dental anxiety in this age-group. The results demonstrated that child dental anxiety status was significantly related to dental factors, psychological developmental factors, and maternal factors. When all sixty data sets were entered into a regression analysis, 92 percent of the variance of the relationship of child dental anxiety could be predicted by eight factors in the three categories ($F = 7.39$, $P < 0.001$). The study demonstrated that the child's ability to cope with dental treatment (as reflected in reported disruptive behaviors) was based upon his/her degree of psychological development together with the mother's fear of dental treatment. It seems that an interaction exists, in which the role of the mother plays a central part influencing on the one hand the child's degree of psychological development and on the other the child's ability to cope with dental treatment. The findings from this preliminary study suggest that factors such as these should be considered by dentists when assessing their child patients, in order to identify and help the anxious child cope with dental care.

Dental anxiety; Disruptive behavior

Gokli, Meera A.; Wood, A. Jeffrey; Mourino, Arthur P. et al: Hypnosis as an adjunct to local anesthesia administration in pediatric patients. J Dent Child, 61:272-275, July-August 1994.

This study investigates the acceptance of local anesthetic injection, utilizing hypnosis in twenty-nine children, ages four to thirteen years. Each subject was evaluated twice, once utilizing hypnosis before injection, and once without. A double blind research design was used to avoid effects of expectancy. Subjects in the study were videotaped during the procedure. Their behavior was rated independently by two pediatric dentists, using the North Carolina Behavior Rating Scale (NBRS). Transcutaneous pulse oximetry data were also recorded for each subject. The resulting data were evaluated for statistically significant differences between the two methods and for interrater reliability.

Results showed no statistically significant differences in oxygen saturation due to hypnosis condition, order of treatment, sex, race, or age. Statistically significant differences were found in pulse rate and behavior, attributable to hypnosis condition and age, but not to sex, race, or order of treatment. Pulse rate decreased with hypnosis, as did crying. The hypnosis condition seemed to be more successful with younger children (four to six years old).

Hypnosis; Injection of local anesthetic

Davila, Jorge M.; Herman, Ann Elizabeth; Proskin, Howard M. et al: Comparison of the sedative effectiveness of two pharmacological regimens. J Dent Child, 61:276-281, July-August 1994.

This study was designed to evaluate the effectiveness of two orally administered pharmacological regimens. The subjects were twenty-six patients requiring a sedative premedication for dental treatment, due to difficult behavior.

A randomized, double-blind, crossover design was employed using chloral hydrate syrup, 30 mg/Kg; and diphenhydramine HCl, 1.5 mg/Kg orally, not to exceed 2,000mg and 75mg, respectively; and chloral hydrate syrup, 30 mg/Kg; and diazepam solution, 0.2 mg/Kg orally, not to exceed 2000mg and 10mg, respectively. The level of conscious sedation was assessed, utilizing two scales employed previously in other studies.

It was demonstrated that it is possible to maintain a low-dose range of sedative medication with satisfactory results. The combination of diazepam and chloral hydrate was found to be more effective than the diphenhydramine, chloral hydrate combination.

Chloral hydrate and diphenhydramine; Chloral hydrate and diazepam; Sedation

McKnight-Hanes, Carole; Myers, David R.; Davis, Harry C.: Dentists' perceptions of the variety of dental services provided for children. J Dent Child, 61:282-284, July-August 1994.

The purpose of this project was to describe the variety of dental services provided to child patients by general dentists and pediatric dentists.

A survey was mailed to a random sample of 2000 general dentists and 1000 pediatric dentists requesting information about the dental services provided to children. Six hundred sixty-two general dentists (33 percent) and 492 pediatric dentists (49 percent) responded.

Pediatric dentists reported more frequently obtaining informed consent ($p < .0001$), placing strip crowns ($p < .0001$), steel crowns ($p < .0001$) and pulp treatment procedures ($p < .0001$). Sealant use in both groups was high but the general dentists reported more frequently sealing occlusal surfaces with incipient caries ($p < .001$).

There were differences in the reported provision of orthodontic services. The general dentists were more likely to refer children for treatment while the pediatric dentists reported they performed limited or comprehensive orthodontic treatment ($p < .0001$).

The results of the survey demonstrate that pediatric dentists perceive that they provide a broader scope of restorative and orthodontic services.

Dental services; General dentists; Pediatrics

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3. There are considerable numbers of elderly with financial resources who are reluctant to contribute to the escalating costs of their own health services. Case in point—the repeal (after "explosive" demands by the elderly) of the comprehensive component of Medicare which would have placed a tax on *only* those elderly with higher incomes. (Yes, the elderly are parents and grandparents. Maybe that's why they don't want to spend their money, preferring to leave it in their wills for their children and grandchildren.)

Incidently, what about all those senior citizen discounts, regardless of the financial status of the particular individual (for which I shortly will be eligible and no doubt accept gladly)—should that be termed "age discrimination"?

4. The State of Oregon, under its Medicaid program, has recognized the need to establish priorities in providing health services to maintain fiscal responsibility. Is this but the first step in a process that will spread throughout a national health system?

How will our children fare in such a competitive environment? Politicians do respond to those who vote. Note: approximately 65 percent of those 65 years and over vote, compared to 20 percent of those age 20, and 0 percent of children.

The bottom line truly is competition for limited funds. Yes, demand more for health and social services, but recognize that there are limits. Politicians do like to get re-elected and they are reluctant to raise taxes. If we believe our youngsters need and deserve more support, we must make the case—even if it is to compare the needs of children to those of the elderly (many of whom are sitting on considerable nest eggs). Keep fighting Saul!

Sincerely,
H. Barry Waldman, DDS, PhD
Professor and Chairman

ABSTRACTS *continued from page 299*

Waldman, Barry H.: Mom is out working: Who is taking care of the kids? J Dent Child, 61:285-288, July-August 1994.

A review is provided of the variety of child care arrangements that increasingly are being used by employed women. The potential impact on pediatric practices is considered.

Child care; Impact on practices

Waldman, Barry H.: Children in rural areas: Extending the horizons of pediatric dental practice. J Dent Child, 61:289-292, July-August 1994.

A review is provided of available census data on nonurban populations in an effort to stimulate interest in the potential for pediatric dental practice in nontraditional service areas.

Pediatric dental practice; Nontraditional service areas

Tsubouchi, Jiro; Higashi, Tomohiro; Shimono, Tsutomu; Domoto, Peter K.; Weinstein, Philip: A study of baby bottle tooth decay and risk factors for 18-month old infants in rural Japan. J Dent Child, 61:293-298, July-August 1994.

Caries risk factors in rural Japan were identified for 637 children age eighteen months. Oral examinations, behavioral risk questionnaires and caries activity tests(Cariostat) were utilized. Results indicated an overall 13.7 percent prevalence of decay and strong correlations between Cariostat and caries status. Of the behavioral risk factors, weaning from breast feeding was most closely related with caries status. All factors resulted in correct classifications of Cariostat score and caries status. These results suggest that a screening of high risk infants can be accomplished by using the questionnaire and Cariostat test.

Caries risk; Caries status; Cariostat score