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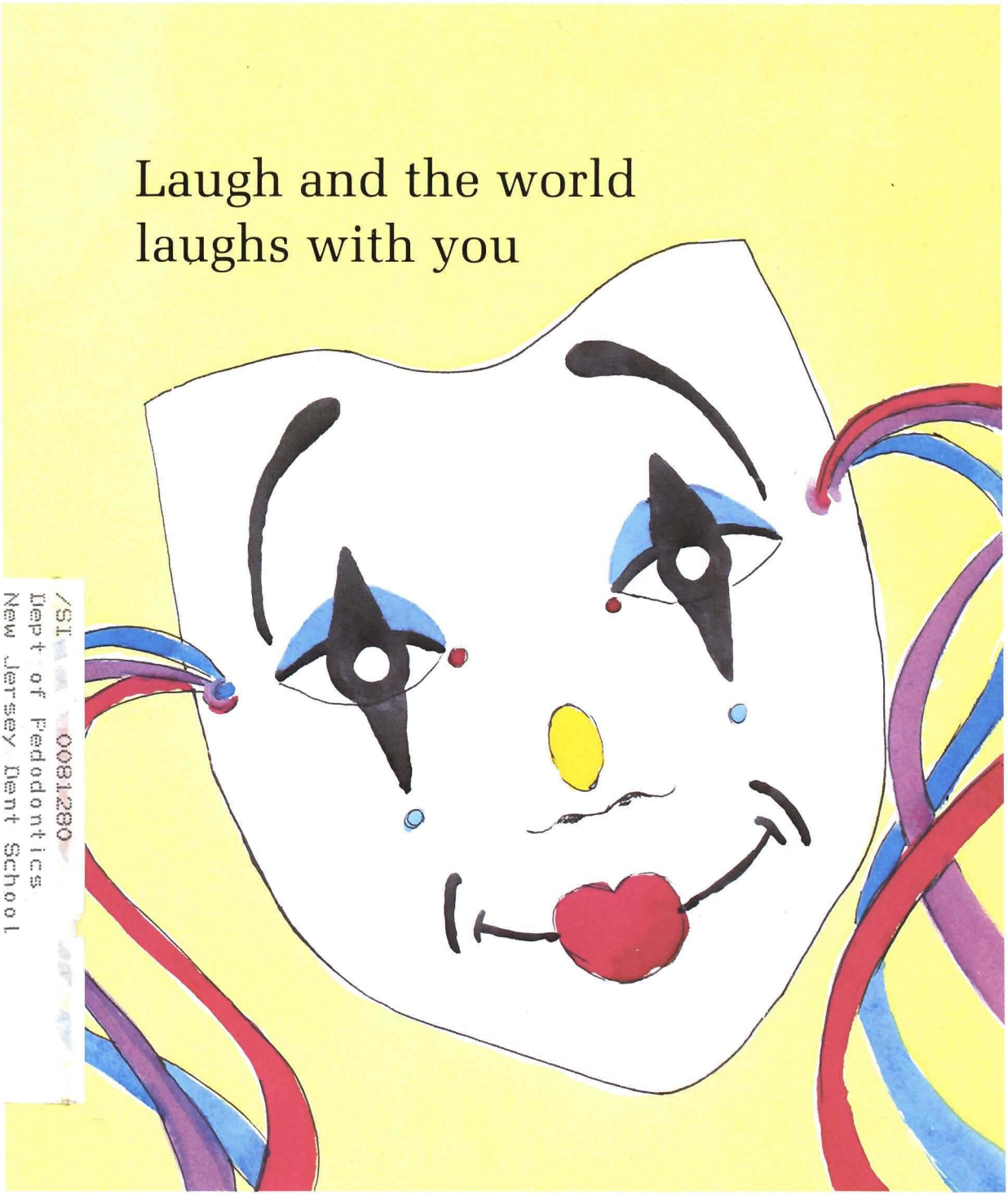

PUTTING THE CHILD PATIENT AND PARENT AT EASE

ASDC AMERICAN SOCIETY OF DENTISTRY FOR CHILDREN

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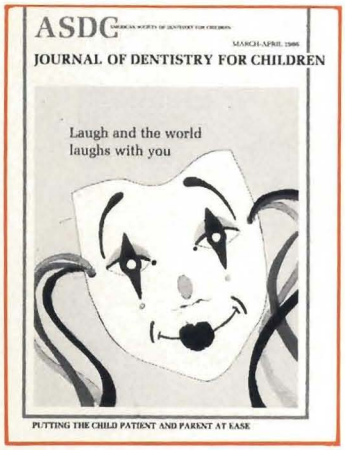

Humor and laughter are useful elements of the dentist's efforts to relax his pediatric patients and lessen their emotional stress. Art and design by Sharlene Nowak.

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CASE REPORT

NUTRITION

For the busy reader

Use of humor in managing clinical anxiety—page 97

Going to the dentist can be a stressful event, often causing anxiety in the child patient. A sampling of pediatric dentists was undertaken to study their use of humor in the clinical setting. Dentists use both common and individual types of humor and create a playful/humorous atmosphere with verbal and nonverbal cues to their patients.

Requests for reprints should be directed to Dr. Joseph Shapira, Department of Pediatric Dentistry, Hadassah Faculty of Dental Medicine, P.O.B. 12000, Jerusalem, Israel.

Parental influence on child preference of a dentist—page 101

It is the attitudes of our society that create sexual bias and stereotyping, which develop in the preschool years. One hundred and seventy children, 4-5 years of age, were interviewed and their mothers were given a questionnaire. The child's preference for a dentist was related to his or her own gender, with girls selecting women more often than boys selecting men. Parents did not appear to influence the child's selection.

Requests for reprints should be directed to Dr. Ronald Johnson, Chairman, Department of Pediatric Dentistry, University of Southern California, Los Angeles, CA 90089-0641.

Children's preventive dental behavior in relation to their mothers' socioeconomic status, health beliefs, and dental behaviors—page 105

This study examined the relationships between the preventive dental behaviors (PDBs) of children from 495 American families, their mothers' socioeconomic status (SES), health beliefs, and dental behaviors. Mothers' PDBs were the cofactors most strongly correlated with children's PDBs.

Requests for reprints should be directed to Dr. Meeishia Chen, Community and Health Programs, University of Texas at Austin, Bellmont 222, Austin, TX 78712.

Evaluation of bitewing intervals in children—page 110

With 1,153 pairs of bitewing radiographs representing data collected from 145 patients, we determined that the average positive bitewing interval was 17.7 months, which is consistent with published recommendations of 12- to 24-month intervals.

Requests for reprints should be directed to Dr. Jan E. Kronmiller, Department of Pediatric Dentistry, School of Dental Medicine, University of Pittsburgh, Pittsburgh, PA 15261.

The effects of primary molar ankylosis on root resorption and the development of permanent successors—page 115

This study investigated the association of ankylosed primary molars with subsequent clinical problems, and found a significant association between the delay in root resorption of the first and second ankylosed primary molars and the delay in root formation of their permanent successors.

Requests for reprints should be directed to Dr. M.M. Nazif, Dental Department, Children's Hospital of Pittsburgh, 125 DeSoto Street, Pittsburgh, PA 15213.

Fractured permanent incisors among Nigerian school children—page 119

An epidemiological survey was conducted on 2,979 Nigerian school children to assess the prevalence of fractured incisors. Of this 10- to 17-year-old group, 14.17 percent had one or more fractured incisors, with the maxillary central incisor the tooth most frequently involved in trauma.

Requests for reprints should be directed to Dr. Bode Falomo, Department of Restorative Dentistry, College of Medicine, University of Ibadan, Ibadan, Nigeria.

Incidence of an accessory distal root on mandibular first permanent molars in Hispanic children—page 122.

The right and left mandibular first permanent molars of 156 Hispanic children were studied radiographically to determine the incidence of an accessory distal root. The overall incidence was 6.4 percent for 73 boys and 83 girls combined, results that differ from reports of other ethnic groups.

Requests for reprints should be directed to Dr. Robert Steelman, University of Texas Health Science Center, Children and Youth Project, Department of Pediatrics, Dallas, TX.

The single maxillary central primary incisor: report of case—page 124

The presented case is a single anomaly not associated with other conditions. In rare cases of the solitary maxillary incisor, the tooth is symmetrical and is always present in the midline, but the crown and root of the tooth are the size of a normal central incisor.

Requests for reprints should be directed to Dr. Sabine C. Maréchaux, Pedodontic Clinic of the University of Geneva Dental School, Geneva, Switzerland.

Garre's osteomyelitis: report of case associated with a granuloma—page 127

This article reports a case of Garre's osteo with an atypical cause, and a differential diagnosis of other conditions that appear with similar clinical and radiographic findings is included.

Requests for reprints should be directed to Dr. Anthony Farole, Division of Oral and Maxillofacial Surgery, Thomas Jefferson University Hospital, 130 South 9th Street, Suite 1120, Philadelphia, PA 19107-5293.

Dental management of oculodentodigital dysplasia: report of case—page 131

This case report describes the aggressive treatment plan designed to maintain the dentition of a 2½-year-old child with oculodentodigital dysplasia (ODD).

Requests for reprints should be directed to Dr. James E. Jones, James Whitcomb Riley Hospital for Children, 702 Barnhill, #1162, Indianapolis, IN 46233.

Ankylosis in monozygotic twins—page 135

In this case report, Twin A had four teeth ankylosed and Twin B had five teeth involved; there was a nearly identical pattern of distribution and severity of ankylosis.

Requests for reprints should be directed to Dr. Mark L. Helpin, Department of Pediatric Dentistry, University of Mississippi, School of Dentistry, 2500 North State Street, Jackson, MS 39216-4505.

Dietary antioxidants and cancer—page 140

Scientifically valid data on the relationship of antioxidants to cancer come from three major sources: human epidemiological studies, experimental studies with animals, and *in vitro* tests for genetic toxicity.

Reprints are unavailable.

Health implications of obsesity—page 144

Obesity, the excessive storage of energy in the form of fat, is clearly associated with hypertension, hypercholesterolemia, diabetes (Type II), certain cancers, and other medical problems.

Reprints are unavailable.

Use of humor in managing clinical anxiety

Behavior

Ofra Nevo, PhD
Joseph Shapira, DMD

Dental visits can be stressful events for many children. Indeed, anxiety and fear can influence the child's willingness to accept dental care or to follow certain courses of treatment. Several behavioral techniques for alleviating the anxiety of children in the dental office have been applied, therefore, in this situation, including modeling behavior shaping, and systematic desensitization.[1-3]

Systematic desensitization consists of introducing the patient to a response that is incompatible with an existing undesired response, anxiety. Through the principle of counter-conditioning, the anxiety is diminished.[4] Traditionally, deep muscle relaxation has been used to lessen anxiety; but recently, emotive-cognitive imagery has been effectively employed.[5,6] The patient is encouraged to experience imaginatively relaxing situations, instead of, or coupled with, muscle relaxation. Ayer demonstrated the effectiveness of emotive imagery in dental settings.[7]

HUMOR APPLIED

Ventis was the first to point out the potential of the humor response as a counter-conditioned response to anxiety.[8] He published a case study describing a girl student who was helped by humor to overcome the

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anxiety of going to a party, where she expected to see an old boy friend in the company of a new girl friend. Because time was short, it was not feasible to train her in muscle relaxation. The therapist, therefore, used humorous imagery instead of relaxation, in a systematic desensitization of anxiety. The girl was able to attend the party with only mild apprehension.

Another case was reported by Smith, who used the same technique to deal with the excessive anger of a mother toward her child and husband.[9] A related technique was reported by Phillips and Judd in their book "How to Fall Out of Love".[10] They suggest to clients who have lost love objects (through divorce, separation or death), and are unable to stop thinking about them, that they systematically imagine their ex-lovers in absurd and ridiculous ways. They cite a few interesting and successful applications of humor to relieve such pains.

Three common elements in the application of humor within the counter-conditioning model were utilized in the above studies:

- ☐ Humor may help by changing emotions.
- ☐ Humor may help by changing perception, conceptualization, or cognitive assumptions.
- ☐ Humor may help when time is short and training for muscle relaxation is not feasible.

In all of these studies, therapists and patients were creating bisociations, a concept basic to the psychology of humor, defined by Koestler as "perception of a situation in two self-consistent but habitually incompatible frames of reference."[11] For example: Mickey Mouse, Disney's famous hero, is essentially funny because of two inconsistent, incongruous concepts that are united in him, a human being and a mouse. The bisociation of two concepts habitually incompatible creates incongruity, which is considered by most psychologists as the main element in the explanation of humor.[12] In addition to the creation of incongruities, therapists have used other techniques, such as absurdities, exaggerations, representation of the opposite, puns and plays on words like those suggested by Freud.[13]

The idea of the present study took shape, when the first author took her two sons to a new dentist. One visit to this new dentist alleviated their anxiety and fear. They now go to the dentist enthusiastically and even deny having been submitted to an injection or pain.

One of the characteristics of this dentist was his use of humorous bisociations, play and imagination. This formed the basis for cooperation between a pediatric dentist and a psychologist of humor, in an attempt to answer the following specific questions concerning the use of humor by dentists:

- ☐ What sort of humorous bisociations or incongruities are created?
- ☐ Are other components of humor present?
- ☐ Does humor operate within the systematic desensitization model?
- ☐ What functions does humor serve?

The purpose of this study is to survey the use of humor as a behavior modification technique used by pediatric dentists. To our knowledge the use of humor as a means to reduce anxiety of the child dental patient had not been reported in the dental literature.

SUBJECTS

Ten specialists in pediatric dentistry (eight men and two women) on the Faculty of the Hadassah School of Dental Medicine, Jerusalem, were interviewed. This group combined the use of modern dental techniques with sensitivity to the problems of behavior management of children.

METHOD

Each dentist was interviewed individually. All interviews began with an open question concerning the use of humor in dentistry. They were then asked to recall their exact verbalizations during a typical visit, including the admission of the patient, seating him in the chair, and explaining equipment and the course of treatment. At the conclusion of the interview, specific questions concerning techniques of humor and its functions were asked. Three dentists were observed in actual work, to verify the interview.

RESULTS

The data collected will be described in the following ways:

- ☐ Common use of humor: The usual procedure mentioned by most pediatric dentists and related to most patients.
- ☐ Individualized use of humor: Mentioned only by a few and related to special cases.
- ☐ Functions of humor: The functions of humor described by dentists.

Common use

When the child walks into the clinic, he is usually met by a smiling receptionist who takes him to the waiting room, where he can amuse himself with books, cartoons, games and toys. When his turn comes, he is greeted cheerfully by the dentist who smiles at him and tries to make small talk with some humorous remarks, usually about the last holiday, hair-style or a current TV hero.

All the dentists interviewed used the same technique—Tell, Show and Do developed by Addelston.[14] The object of this technique is to desensitize the child gradually to the anxiety provoking stimuli in the dental clinic. Dentists using it are encouraged to use language and concepts which are easy for the child to understand. This has resulted in the development of a special language of euphemisms based on bisociations of concepts from the child's world to the anxiety provoking medical terms.

Most of the bisociations are humorous. For example:

The dental chair. Airplane, spaceship, elevator, seesaw. (Fly "up and down" in the chair)

Opening the mouth. "Open your mouth like a lion!" "Let's see if you still have teeth (or a tongue)".

Light. "We use a light because your mouth does not have windows."

Topical anesthetics. "Orange juice or jam to numb your cheek or gums." "I have pudding in three flavors: Orange, Banana or Strawberry. You can choose which."

Local anesthetic (injection). "The teeth go to sleep. You stay awake to help." (Personification of the teeth) "The teeth drink from a bottle. Don't drink so fast!" (Never mention the word "injection").

When a few drops leak into the mouth, the taste is awful. The dentist makes all sorts of sympathetic sounds, like "Yick, Yuk . . ." Making noises to distract attention.

Big mirror. "Take the mirror and see if you still look pretty (or handsome)." "It feels funny but you look O.K.!" "Can you see brown-black staining with the big hole? This is the place where Carius and Bactus live."

Rubber dam. Rain coat.

Rubber dam clamp. "It's a tooth ring; put it on your finger and see if it fits!"

Suction. Vacuum cleaner.

Air syringe. Nice poofpoof!

Slow-speed turbine (drill). Tractor, bulldozer.

High-speed turbine (drill). Fireman's hose.

Saliva ejector. A duck drinking; a pump.

Cavities. "Cariuses and Bactuses."

Filling matrix. Baking pan.

Filling. Making a cake. "Do you have silver-colored play-dough in your kindergarten?"

Forceps. "Like a parrot with two wings, the screw is the eye of the parrot. The parrot is looking for food".

Individual use

In addition to the common humorous bisociations, some dentists reported individual variations.

Rhymes

Some use rhymes specifically for the younger patients. (rhymes are in Hebrew!) For example:"Halashon Telech Lishon"—The tongue will go to sleep.
"Notzi et Hashahor Mitoch Hachor"—Let's take the black out of the hole.

Riddles and Questions (For older patients)

"When do you eat matza?" "Passover!" "When do you eat turkey?" "Thanksgiving." "And when do you eat sweets?" "All the year!", "No, Never!"

Absurdities and Exaggerations

Representation through the opposite. "It's going to hurt a lot!" (When in fact it does not hurt at all). "Next time I will try harder!"

"If the patient asks, "How do you put my mouth to sleep?" Some answer with exaggerations: "I have a five-kilo hammer and I pound hard with it."

Allusions to popular media heroes

Some make bisociations with popular TV programs and books, the most popular being "Carius and Bactus," a humorous cartoon book describing two heroes representing the bacteria involved in caries.[15]

Functions of humor

According to the dentists interviewed, humor serves several functions:

- ☐ *Social:* Forming and maintaining a relationship.
- ☐ *Emotional:* Relief of anxiety of the child, the mother and the dentist. Several humorous remarks were specifically intended for the mother.
- ☐ *Cognitive:* Changing perceptions of the situation; distracting attention from fearful stimuli.
- ☐ *Informative:* Transmitting essential information in a nonthreatening manner, making it easier to follow instructions.
- ☐ *Motivational:* Increased interest and involvement of both the child and the dentist.

DISCUSSION

The purpose of this study was to collect data concerning the use of humor in the child dental clinic, focusing on the specific ways dentists utilize humor.

When asked an open question about their use of humor, dentists were not aware of their frequent and consistent utilization of humor. Only later analysis of

their behavior and verbalizations reveal a systematic picture.

Most of the humor in the clinic is initiated by the dentist (since the patient is unable to talk most of the time!). The dentist and his staff give the child nonverbal cues so that he will perceive the situation as playful and nonthreatening, frequently using terms like "funny, nice and happy". The child knows that the chair is not an airplane and the suction is not a vacuum cleaner, but he is ready to make believe. Children at age two to six years tend to respond to simple incongruities with humor and laughter, provided that they have cues that enable them to perceive the incongruity as nonthreatening.[16] The child needs cues precluding seriousness or needs to be put in a "humor set" in order to perceive incongruous situations as humorous.[17,18]

The dentists participating in this study supply by their behavior, the two most important elements required for humor: They create incongruities and give many cues precluding seriousness. They also use other types of humor such as rhymes, puns, exaggerations, and representations by the opposite. They all work according to the systematic desensitization model of humor as suggested by Ventis:

- ☐ They present anxiety producing stimuli gradually (following the T.S.D. model).
- ☐ In conjunction with humorous cognitive images.[8]

Dentists report being sensitive to the ages of their patients. When working with young, they rely on rhymes and fantasy, while with older children they are apt to use riddles and exaggerations. This corresponds with findings on developmental changes in humor.[12]

Humor, trivial as it seems, fulfills several functions. In addition to reducing anxiety, it can help create and maintain rapport, transmit important information through enjoyable means, and increase interest and involvement of both the child and the dentist.

As for the last function of humor, dentists have one of the highest rates of professional burnout.[19] Creating humor and communication may combat such burnout by promoting more relaxing relationships.

Reservations

When applying humor, one has to take into consideration the "double-edged" character of humor. It can be painful for some patients and enjoyable for others.

It is of utmost importance to present humorous bisociations in a nonthreatening manner. In no way should humor disparage the patient. It can be at the expense of the equipment, the activities and sometimes the dentist himself, but never at the expense of the child. The main thing is: Laugh with the patient, not at him!" (as one learns when humor does not work).

Humor should be used only when the child is in the right mood or "set" and should be used in accordance with the developmental capacities of the patient. Cynical and absurd remarks would not suit young children and rhymes would be inappropriate for adolescents.

Humor is no substitute for good behavior management, but an effective complementary device.

CONCLUSIONS

It has been demonstrated that the sample of pediatric dentists surveyed use humor consistently within a systematic desensitization model. They create humor sets, humorous bisociations, incongruities, rhymes, absurdities, exaggerations and puns. They do it with a sensitive regard to patient's developmental stage.

Humor is not a prerequsite for being a good pediatric dentist, but it can help. Only further research comparing dentists who use humor to those who do not, may indicate the specific contribution of humor in the reduction of anxiety in the child dental clinic.

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Parental influence on child preference of a dentist

Linda S. Barconey, DDS
Ronald Johnson, DDS

Research on sex stereotyping in our society has been documented in the psychology literature. Ellis, Rosenkrantz and Vogel, and Spence and Helmreich concluded from their investigations, that sex role stereotypes do exist and definite values are placed on these stereotypes.[1,2,3] Rosenkrantz and Vogel further state that it is the attitudes of our society that create difficulties of sexual bias and stereotyping. Macoby and Jacklin and Hartley and Hardesty agree that sex typing develops in the preschool years.[4,5]

White *et al* state that "traits" constituting the masculine stereotype are those typically associated with achievement in high level professions, whereas those of the feminine stereotype are associated with occupations necessitating nurturance, warmth, and sensitivity to others.[6] Due to technological changes in our society and various social movements, women have been able to combine the roles of housewife and working wife. This has contributed to the convergence of roles and status of the sexes in modern society. Since women are becoming more involved in professions once taboo to them, the question arises, "How is the public viewing them in regard to their competence to do the jobs?" For instance, dentistry has been a male dominated profession. In the last ten years, however, changes have occurred. The ADA Council on Dental Education reported in 1980 that enrollment of women in dental schools has increased more than ten times during the years 1970-1978.[7]

The public is becoming better educated about dentistry, and with an increased awareness and the availability of choices for dental care providers, anxiety may be reduced. This could have an important impact on dental health care delivery. White, in his 1982 survey investigating potential dental patients' perceptions of women dentists, concluded that "Women in the area of dentistry were able to combine both the competence associated with the masculine role and the caring associated with the feminine role. Both qualities are needed for the practice of dentstry."[6]

Organized dentistry has been trying to improve its image over the years. Wright states that if we are to promote positive dental attitudes and improve the dental health of the public, then logically, children are the keys to the future.[8] Parents serve as role models, and children are influenced early in life by their varying opinions. Johnson and Baldwin, and Wright in their investigations both agree that in the dental setting the cooperation of the child is directly related to the opinions and anxieties of the maternal figure.[9,10]

Kleinknecht identified several variables in the dental setting that are important in the development of children's attitudes toward dentistry.[11] These attitudes have been reported to be either negative or positive. One of the variables that determined a negative or

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positive attitude was the patient's perception of the dentist and subsequently his like or dislike for him.

The purpose of this investigation is to determine whether a child's attitude about the dentist could be related to the parental opinion and selection of a dentist and whether this could influence the child's preference for a male or female dentist. The hypothesis would be that the child's selection of a dentist will be similar to that of one of his parents. In addition, the sex of the dentist selected by the child will be directly related to the actual sex of the child (i.e., male children will select male dentists and vice versa).

METHODS AND MATERIALS

One hundred and seventy children participated in the study. Ninety-two were males and seventy-eight were females. Selection was made according to the following criteria: the child had to be four to five years of age, should have no mental disorders, handicapping conditions, nor a previous record of dental treatment. The study population was randomly selected from preschools, day care centers and elementary schools of the Los Angeles County area.

A lecture concerning oral hygiene and prevention of dental disease was given to the parents. Prior to the lecture a parental questionnaire (Figure 1) and a letter of consent were completed and signed by a parent, if they wanted to participate in the survey. The children of the parents who wished to participate were interviewed. One operator conducted the interviews, which consisted of showing the child four photographs, two female and two male dentists (Figure 2). The following questions were asked of each child, regarding the pictures:

- ☐ Which of these people would you like to have as your dentist?
- ☐ Would you like a male or female (man or lady) for your dentist?
- ☐ Which of these is a lady?
- ☐ Which of these is a man?

After the child's interview, an oral examination utilizing a tongue depressor and visible light was done and the result of a screening evaluation of the child was given to each parent.

Statistical analysis

A 2 x 3 contingency chi square was utilized on collected data to determine whether the sex of the parent and child were independent of the sex of their selection of a dentist. Questions 5, 6, 7 and 8 were analyzed because they directly related parental choices of a dentist and question number 2 of the child interview related to the child's preference of a dentist.

Figure 1

QUESTIONNAIRE

Thank you for participating in this project, which we feel will make your child's initial exposure both pleasant and rewarding. It is very important that you answer all of the questions as truthfully as possible because our interpretation of your answers will be used as the basis for our method of patient management. If you answer inaccurately or other than you feel, then we could make a mistake in our initial approach and technique of child management.

This is your child's first experience with a dentist and we want this experience to be as pleasant and meaningful as possible. Only through your cooperation and honest evaluation of your child's and your past experiences will we be able to provide the best treatment.

Please check one answer per question.

_____ Parent's Name

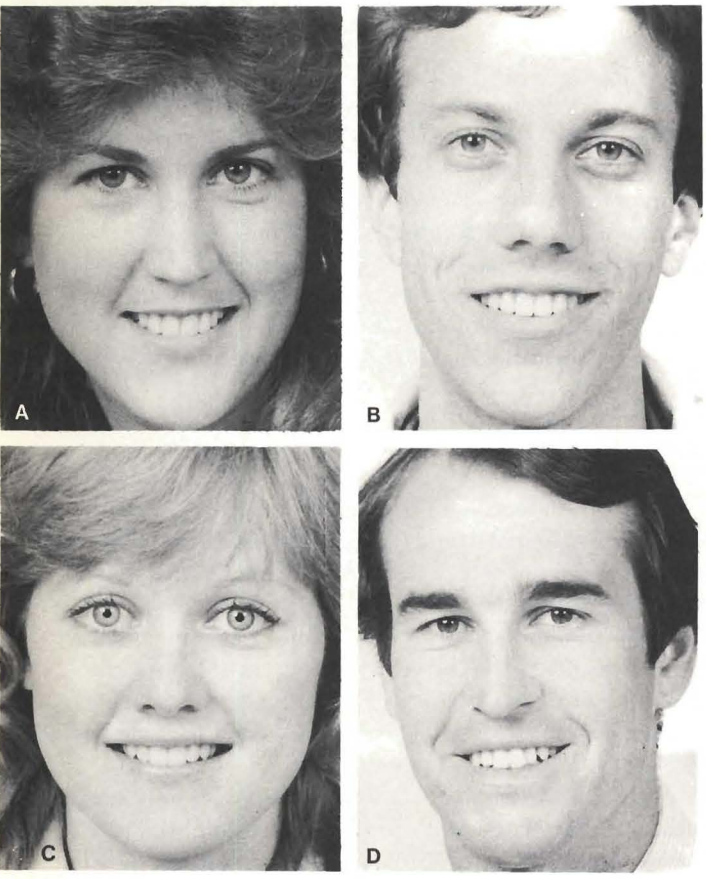
_____ Child's Name

_____ Date

_____ Age/birthdate

1. Which of the following best describes how often you visit a dentist:
   - _____ every six months or less
   - _____ once a year, regularly
   - _____ only if I have to for a dental problem (i.e. toothache, broken tooth, painful gums, etc.)
2. How would you describe your visits to the dentist:
   - _____ enjoyable or pleasant
   - _____ tolerable
   - _____ nerve wracking
   - _____ terrifying
3. Will this be the first time your child has been seen by a dentist?
   - _____ Yes
   - _____ No
4. How many times has your child been seen by a dentist?
5. Which type of dentist would you prefer:
   - _____ Male
   - _____ Female
   - _____ No preference
6. Which type of dentist would you want to treat your child:
   - _____ Male
   - _____ Female
   - _____ No preference
7. If you were in an emergency situation which type of dentist would you prefer:
   - _____ Male
   - _____ Female
   - _____ No preference
8. If your child was in an emergency situation which type of dentist would you prefer:
   - _____ Male
   - _____ Female
   - _____ No preference

Figure 2



RESULTS

QUESTION #5

Which type of Dentist would you prefer?

Parent Selection of Dentist

Parent sex	Male	Female	NP	Total
Male	17 (40%)	7 (17%)	18 (43%)	42
Female	21 (16%)	14 (11%)	93 (73%)	128
Total	38	21	111	170

$x^2 = 12.7$
$P < 0.005$

From this analysis it was found that the sex preference of a dentist made by the parent was dependent to some extent on the sex of the parent. In this investigation males were more likely than females to select dentists of their own sex or have no preference. There was no preference nearly 75 percent of the time for females. There was no great tendency to select a female dentist, regardless of the sex of the parent.

QUESTION #6

Which type of Dentist would you want to treat your child?

Parent Selection of Dentist

Parent sex	Male	Female	NP	Total
Male	14 (33%)	7 (17%)	21 (50%)	42
Female	12 (9%)	16 (13%)	100 (78%)	128
Total	26	23	121	170

$x^2 = 14.252$
$P < 0.005$

The conclusion is identical to that of question number 5 (of course the percentages are slightly different).

QUESTION #7

If you were in an emergency situation which type of Dentist would you prefer?

Parent Selection of Dentist

Parent	Male	Female	NP	Total
Male	13 (13%)	4 (10%)	25 (59%)	42
Female	8 (6%)	11 (9%)	109 (85%)	128
Total	21	15	134	170

$x^2 = 15.816$
$P < 0.005$

The conclusions are the same as questions numbers 5 and 6.

QUESTION #8

If your child was in an emergency situation which type of Dentist would you prefer?

Parent Selection of Dentist?

Parent sex	Male	Female	NP	Total
Male	14 (33%)	4 (10%)	24 (57%)	42
Female	6 (5%)	12 (9%)	110 (86%)	128
Total	20	16	134	170

$x^2 = 21.69$
$P < 0.005$

The conclusions are the same as the above questions, but with different percentages.

QUESTION #2

Would you like a male or female (man or lady) as your Dentist?

Child Selection of Dentist

Child sex	Male	Female	NP	Total
Male	58 (63%)	26 (28%)	8 (9%)	92
Female	10 (13%)	62 (79%)	6 (8%)	78
Total	68	88	14	170

$x^2 = 51.78$
$P < 0.005$

The results indicated that the sex preference of a dentist made by the child was dependent on the sex of the child. In this investigation, the child was most likely to choose a dentist of the same sex, with girls more often choosing women than boys selecting men. The children, unlike their parents, rarely indicated no sex preference for their choices of dentist.

DISCUSSION

In traditional families, girls show a strong feminine preference in preschool years, which seems to diminish as they get older, whereas the preference of boys for the male role increases steadily throughout the elementary years and is more consistently reinforced.[12] Boys are usually strongly influenced by cultural standards and expectations in their behavioral conformity with the above dictum. Preschool children choose the parent of the same sex as models for sex roles. Children of ages four to five years are usually exerting their independence and have definite attitudes about what they do and do not want. They usually will associate and play with children of their own sex.[12]

The Womens Liberation Movement of the late 1960's challenged the traditional cultural stereotype of gender roles both for adults and children, initiating a process of redefinition of feminine and masculine roles. Today 51 percent of American women work outside the home. Overall 43 percent (48 million) married mothers with children under six years of age now work outside the home.[13]

The parent's selection of a dentist (no preference, greater percentage) can best be explained by different sociological forces. Adults are interacting with members of both sexes in all aspects of daily living. Since women are becoming more visible and performing on competent levels in society, it seems reasonable that attitudes would change in regard to female capabilities.

A study is needed to reinforce the validity of the findings in this investigation. That is, if a child had his choice (male or female) of dentist would there be any difference relative to his behavior in initial or subsequent dental appointments. There have been many documented studies on children's behavior in the dental environment and what influences and modifies this behavior. The area that has been overlooked is the child's role in making the decision relative to his choice of dentist. This could influence his behavior in the dental setting and possibly make a pleasurable experience of the visit.

CONCLUSION

A study was undertaken to determine whether a child's selection of a dentist would be similar to that of one of his parents, and if this selection would be directly related to the sex of the child.

The results indicated that the parent's selection of a dentist was related to the sex of the parent. Males were more likely to select dentists of their own sex or have no preference than were females. Females had no preference nearly 75 percent of the time. There was no great tendency to select female dentists regardless of the sex of the parents. The child's preference of a dentist was directly related to the sex of the child. Children most often chose a dentist of their own sex. Parents did not appear to influence their child's selection of a dentist.

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Children's preventive dental behavior in relation to their mothers' socioeconomic status, health beliefs and dental behaviors

Meei-shia Chen, PhD, MPH

The relationships between children's health behaviors and their mothers' or parents' socioeconomic status, health beliefs and health behaviors have been investigated in a number of previous studies. Among these studies, those addressing the relationships of children's health behaviors with their mothers' socioeconomic status or with their mothers' correspondent behaviors have had more consistent findings than the association between children's health behavior and their parents' health beliefs. For example, previous studies demonstrated that children's preventive dental visits were associated with parents' incomes, educational levels, and occupations.[1-3] In addition, some studies showed that mothers or parents whose dental visits were prevention-oriented were more likely to have children who received preventive dental care.[1-4] This relationship was also found to be true in other health behaviors such as smoking, alcohol use, marijuana use, and physician visits.[5-8]

Studies on the association of mothers' health beliefs with their children's health behavior are inconclusive. As an example, a recent study reported that parental health beliefs were not significantly related to children's health behaviors such as snacking, tooth cleaning, breakfast frequency, and smoking.[4] Other studies, however, reported significant correlations of mothers' health beliefs and preventive care visits for their children, as well as with mothers' compliance with a dietary regimen prescribed for obese children.[9,10]

Which is the most dominant factor among the mothers' variables that contribute to children's preventive dental behavior? Few studies have compared the importance of mother's sociodemographic characteristics, health beliefs and dental behavior to their children's dental behaviors. In the present study, an examination and comparison of the relationships between children's preventive dental behavior (i.e., brushing, flossing, and preventive dental visits) and their mothers' sociodemographic variables (i.e., family income, mothers' occupations, ages, and educational levels), health beliefs (beliefs in susceptibility seriousness, barriers, and general health perception), and preventive dental practices were analyzed. Furthermore, studies that focus on the differences between children's brushing, flossing, and preventive dental visits with respect to their relationships with the above-mentioned characteristics of their mother are lacking. Also compared, therefore, were the patterns of these relationships among children's toothbrushing (an example of habitual oral hygiene practice), flossing (exemplifying a relatively innovative practice), and preventive dental visits (an example of a dental service utilization behavior).

METHODS

The data utilized in this study were abstracted from a national family dental health survey conducted in 1980. One thousand American families were selected by stratified quota sampling in terms of geographical region,

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population density, age of homemaker, annual family income, and family size. A questionnaire was sent by mail and answered by the female head of each family, or male head in male single-parent families (there were only two families of this kind). Six hundred and eighty-five white American families returned the questionnaire. The distribution of the total mailed versus returned questionnaires by the stratification variables indicated that there is no systematic difference between respondents and nonrespondents in terms of region, population density, age of homemaker, annual family income, and family size. Twenty-three respondents, representing nonwhite families who also returned the questionnaire, were excluded from the sample, because the subsample was too small to be representative. A detailed description of the survey design can be found in previous articles.[11,12]

Among the 685 white families that responded, 495 families have female heads and children ranging in age from seven to eighteen years. The results of the present study are based on the data of these families. The families with children younger than six years were not included because the dental visits were too few or use of dental floss too seldom to have meaningful analysis. The dependent variables of primary interest were children's preventive dental behaviors including tooth brushing, flossing, and preventive (or asymptomatic) dental visits. The variable on toothbrushing was a combined index of toothbrushing schedule (i.e., strict, loose, or no particular schedule) and frequency of brushing per day. Flossing index was based on the frequency of dental floss use. A combined index of regularity (regular, irregular, never) of dental check-ups and recency (the last time) of dental visit for dental examination and/or cleaning constituted the variable preventive dental visits. The independent variables (i.e., predictors) included:

- ☐ Mothers' socioeconomic statuses (i.e., family income, mothers' levels of occupation, education and ages).
- ☐ Mothers' health beliefs.
- ☐ Mothers' toothbrushing, flossing and preventive dental visits.

The determination of mothers' health beliefs was based on their perceptions of their:

- ☐ Susceptibility to dental caries and periodontal disease.
- ☐ Attitudes regarding the seriousness of dental diseases.
- ☐ Concern for the barriers against dental care (i.e. high cost of dental care, being too busy to engage in preventive dental behavior, and unavailability of dentists).
- ☐ General health, including their levels of concern about their health and the extent of their fatalistic views on disease occurrence.

The detailed method of measuring health beliefs was described in a previous article.[11]

Hierarchical multiple regression was used to examine the relative influence of mothers' socioeconomic statuses, health beliefs and preventive dental behaviors (i.e., toothbrushing, flossing, and preventive dental visits) on children's preventive dental behaviors. According to commonly assumed causal ordering of socioeconomic status, health beliefs, health behavior, mothers' socioeconomic status variables were entered at the first step, their health beliefs at the second, and their preventive dental behavior at the third.

There were a number of methodological constraints in the present study that should be noted. The preventive dental behaviors of children were reported by their mothers. These data may not be as accurate, therefore, as those for the mothers who reported their own behaviors. Also, the sample included only white American families. Thus, the generalizability of the findings to other races is limited. Finally, the analyses were based on self-reported data; we have to assume the respondents' honesty in answering the questionnaire. Future research should address these limitations.

RESULTS

The zero-order correlation of dependent and independent variables are presented in Table 1. These are the basic statistics for multiple regression analysis. Table 2 shows the summary results (β, R, and R^2) of the hierarchical multiple regression analysis, predicting children's brushing practices from their mothers' socioeconomic statuses, health beliefs, and brushing. (Since the Betas and their significance levels for independent variables did not change significantly from steps 1 to 3, only the summary results of step 3 are shown). In multiple regression, β (the standardized regression coefficient) indicates the relative effect of each independent variable on the dependent variable; R stands for the strength of the correlation between the dependent variable and independent variables; and R^2 shows the proportion of variation in the dependent variable explained by independent variables. The multiple correlation coefficient of the relationship between children's brushing and three sets of independent variables was significant ($R = .362$, $p<.001$), accounting for 13.1 percent of the variance in children's brushing behavior. The magnitudes of the betas for the independent variables indicated that mother's brushing behavior had

Table 1 ☐ Zero-order correlation of dependent and independent variables.

	CBrush	CFloss	CVisit	MBrush	MFloss	MVisit	Income	Occup.	Age	Ed.	Suscept.	Serious	Barriers	Gen. Motv.
C Brush	1.00													
CFloss	.41	1.00												
CVisit	.80	.36	1.00											
MBrush	.28	.13	.11	1.00										
MFloss	.12	.34	.15	.20	1.00									
MVisit	.09	.11	.26	.16	.25	1.00								
Income	.13	.00	.22	.03	.09	.31	1.00							
Occupation	.11	−.01	.13	−.03	−.01	.06	.14	1.00						
Age	.04	.07	.08	−.11	.05	.08	.21	.08	1.00					
Education	−.09	−.04	−.02	.03	−.02	.13	.20	.20	−.10	1.00				
Suscept.	−.04	−.07	−.17	−.08	−.13	−.13	−.04	−.07	.09	−.07	1.00			
Seriousness	.11	.20	.08	.13	.19	.10	.06	.07	.06	.04	−.09	1.00		
Barriers	−.01	−.03	−.08	−.01	−.15	−.27	−.11	−.02	−.02	−.03	−.23	−.01	1.00	
Gen. Motv.	.06	.04	.00	.08	.02	−.07	−.05	−.06	−.21	.12	−.22	.20	−.11	1.00

the strongest effect (β = .278, $p < .001$). None of the mothers' health beliefs was significantly linked with children's brushing ($\beta < .071$, $p > .05$). Family incomes (β = .145, $p < .01$) and mothers' occupations (β = .120 $p < .05$) were correlated positively and mothers' educational levels (β = .160, $p < .01$) were correlated negatively with children's brushing.

The results of the multiple regression analysis on children's flossing are shown in Table 3. The multiple regression coefficient of the relationship between children's flossing and mothers' socioeconomic statuses, health beliefs, and flossing behavior, was significant (R = .372, $p < .001$), accounting for 13.9 percent of variance in children's flossing. Variables comprising mothers' socioeconomic statuses (β .051, $p > .05$) were not significantly correlated with children's flossing behavior. Among four types of health beliefs, only mothers' perceptions of seriousness were significant predictors of children's flossing (β = .141, $p < .01$). Similar to toothbrushing, mothers' flossing had the greatest influence on children's flossing (β = .311, $p < .001$).

Table 4 displays the results of the multiple regression analysis on children's preventive dental visits. The multiple regression coefficient of the relationship between children's dental visits and their mothers' socioeconomic statuses, health beliefs, and preventive dental visits was significant (R = .339, $p < .001$), accounting for 11.4 percent of variance in the children's preventive dental visits. Among variables of socioeconomic status, only family incomes (β = .161, $p < .01$) and mothers' occupations (β = .111, $p < .05$) were significant correlates. As indicated by the values of the Betas, none of the mothers' health beliefs ($\beta \leq .043$, $p > .05$) was significantly related to the children's preventive dental visits. In contrast, the mothers' preventive dental visits were strongly correlated with the children's dental visits (β = .220, $p < .001$).

Table 2 ☐ Regression analysis of the relationship of children's brushing practices to their mothers' socioeconomic statuses, health beliefs, and brushing practices.

Variable	Beta	F	R	R_2
Income	.145	8.07***	.362***	.131
Occupation	.120	5.70*		
Age	.000	<1		
Education	−.160	9.76**		
Susceptibility	.041	<1		
Seriousness	.041	<1		
Barriers	.009	<1		
General Motiv.	.071	1.86		
Mother's Brushing	2.78	31.07***		

*p <.05
**p <.01
***p <.001

Table 3 ☐ Regression analysis of the relationship children's flossing practices to their mothers' socioeconomic statuses, health beliefs, and brushing practices.

Variable	Beta	F	R	R_2
Income	−.036	<1	.372***	.139
Occupation	−.016	<1		
Age	.051	<1		
Education	−.022	<1		
Susceptibility	−.088	<1		
Seriousness	.141	7.85**		
Barriers	.012	<1		
General motiv.	.025	<1		
Mother's brushing	.311	38.91***		

*p <.05
**p <.01
***p <.001

Table 4 ☐ Regression analysis of the relationship children's preventive dental visits and their mothers' socioeconomic statuses, health beliefs, and preventive dental visits.

Variable	Beta	F	R	R_2
Income	.161	9.06**	.339***	.114
Occupation	.111	4.88*		
Age	.000	<1		
Education	−.094	3.27		
Susceptibility	−.024	<1		
Seriousness	.043	<1		
Barriers	.014	<1		
General motiv.	.023	<1		
Mother's visits	.220	16.71***		

*p <.05
**p <.01
***p <.001

DISCUSSION

The results of the present study indicated that a combination of family income; mother's occupation, age and education; and mother's health beliefs and preventive dental behavior were significantly related to her child's toothbrushing, flossing, or preventive dental visits, re-

spectively. These relationships only accounted, however, for about 11-14 percent of the variance in children's preventive dental behaviors. This indicates that there are other factors that affect a child's preventive dental behavior. More research is needed to explore the variables that contribute to the remaining variance of such behavior.

The results of the present study indicated that among the variables pertaining to mothers' socioeconomic statuses, health beliefs, and preventive dental behaviors, the latter had the strongest effects on children's brushing, flossing, and preventive dental visits. In other words, although the children's preventive dental behaviors include three types of preventive measures (i.e., brushing is a habitual oral hygiene; flossing, a relatively innovative dental health measure; and preventive dental visits, a dental service utilization behavior), they were all strongly related to their mothers' correspondent dental behaviors.

The strong relationships found between children's preventive dental behaviors and those of their mothers confirmed the modeling influence of a mother's behavior on her children, as postulated in social learning theory.[13] These findings also demonstrated the greater importance of a mother's modeling of dental behavior than her health beliefs or socioeconomic status to the formation of her children's dental behaviors. Probably children acquire their toothbrushing or flossing behavior by direct observation and modeling of their mothers' respective behaviors, rather than through the influence of their mothers' health beliefs or sociodemographic variables. It should be noted, however, that the interpretation of mothers' modeling effects may be more complicated in the case of preventive dental visits. Most children visit their dentists with their mothers, which may also have contributed to the high correlation between children's and their mothers' preventive dental visits. The above-mentioned relationships between children's and mothers' preventive dental behaviors not only were in agreement with Freeman and Lambert's study on preventive dental visits, but also extended to personal oral hygiene practices.[1] As also mentioned earlier, similar relationships have been reported for smoking, alcohol use, marijuana use and physician visits.[5-8]

Interestingly, both the children's brushing and preventive dental visits were found to be significantly related to some of the variables of the mothers' socioeconomic statuses (e.g., mothers' occupations and family incomes), which the children's flossing was not. This occurs probably because flossing has not been emphasized to the public as long as toothbrushing or dental visits have been and is not yet widely recognized as another effective dental measure. Indeed, the 1980 national family dental health survey revealed that only 20 percent of wives, 11.5 percent of husbands, and 6.4 percent of children in the sampled families flossed daily.[12] Until flossing is more widely adopted, it would not be significantly associated, therefore, with variables of socioeconomic status. Children's brushing, although a habitual practice, was significantly affected by the mother's socioeconomic status. To compare this finding with that for their mothers' own brushing behaviors, we conducted a multiple regression analysis of the impact of mothers' socioeconomic statuses on their own brushing behaviors and found insignificant correlations ($R = .096$, $p > .05$). In other words, mothers' socioeconomic status influenced their children's brushing, but not their own brushing. Our study found mothers' education to be negatively correlated with children's brushing behavior. This was probably due to the suppression effects of income or occupation, which were highly correlated with education ($r = .20$, see Table 1). As a result, the β for variable of education was highly negative after income and occupation variables had been entered first (for a detailed description of suppression phenomena, see Levine).[14] Since the simple correlation between mothers' education and children's brushing behavior was $-.09$ (Table 1), the actual effect of mothers' education was likely to be insignificant.

One of the major findings in the present study was that, with only one exception (discussed below), mothers' health beliefs did not have significant effects on children's preventive dental behaviors. In a previous study, it was found that mothers' health beliefs were significantly associated with their own toothbrushing, flossing, and preventive dental visits.[11] This finding suggests that mothers rarely communicated their health beliefs orally to their children or influenced them concerning preventive dental behavior through the cognitive mediation of their own health beliefs. In contrast, mothers' dental behaviors may be more visible on a daily basis and thus have stronger direct effects on children's preventive dental behaviors.

The only exception to the findings regarding mothers' health beliefs was that mothers' perceptions of seriousness were positively correlated with their children's flossing behavior. In other words, children were more likely to learn and practice flossing, if their mothers believed that dental caries and/or periodontal diseases were serious enough to affect their health and daily lives. Apparently, mothers with high levels of

perceived seriousness of dental diseases were more likely to teach their children to try such new preventive measures as flossing.

In conclusion, although family income and mothers' occupations did affect children's preventive dental behaviors, it is clear from the present study that mothers' preventive dental behaviors were the most important factor influencing children's preventive dental behaviors. This finding is especially important for dental health educators and professionals who wish to improve children's dental behavior. Children of mothers with poor dental health practices (i.e., personal oral hygiene practices and preventive service utilization behavior) are very likely to have poor dental behaviors themselves. To change these children's dental behaviors effectively, dental health educators and professionals may need to include their mothers as a target population and educate them to become models of proper dental health practices for their children.

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SMOKING REDUCTION PROGRAMS

Several types of programs have been developed in various settings to help pregnant women stop or reduce their smoking habit. Most are based on the finding that pregnancy alone provides a strong incentive to stop smoking. About 20 to 25 percent of women who smoke at the beginning of pregnancy quit on their own at some time during the 9 months. Controlled studies suggest that aggressive intervention programs can encourage up to 30 percent more (beyond those who quit spontaneously) to stop. Unfortunately, about 80 percent of women who quit during pregnancy begin smoking again after delivery.

Institute of Medicine: Preventing low birthweight. Washington, D.C.: National Academy Press, 1985, p 184

Clinic

Evaluation of bitewing intervals in children

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Activities of the American Dental Association Commission on Dental Accreditation and the American Academy of Pediatric Dentistry have emphasized the profession's concern for exposure of child patients to low doses of ionizing radiation.[1,2] In particular, the use of selection criteria to identify patients for whom radiographic evaluations are appropriate has received considerable attention. In a discussion of high yield criteria, Valachovic and Lurie addressed the use of radiographs for detection of interproximal caries and stated that the frequency of such examinations should be dictated by caries activity, the degree of spacing between posterior teeth and the results of a clinical examination.[3] Howard emphasized that routine radiographs based solely on time elapsed since the previous examination were contraindicated.[4]

Among the recommendations of the conference, Radiation Exposure in Pediatric Dentistry, were guidelines for exposure of patients to radiographs to determine the presence of interproximal caries. Radiographs for detection of interproximal caries are indicated when the proximal surfaces of teeth cannot be visually or tactilely inspected. If interproximal caries is

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detected by radiographic examination, then follow-up radiographs are recommended semiannually until the child is caries free and considered at low risk. If no evidence of caries is found, radiographs may be taken every twelve to eighteen months for primary teeth in contact or up to twenty-four months for permanent teeth in contact.[2]

The use of posterior interproximal radiographs (bitewings) for the detection of caries has been substantiated by a number of studies.[5-7] Hennon *et al*, in a study of eighteen to thirty-nine-month-old children, reported that 75 percent of all posterior interproximal lesions would not have been detected unless radiographs were available.[8] Stecksen-Blicks and Wahlin conducted a study to determine the extent to which bitewing radiographs were indicated in preschool children.[9] After selection of children whose proximal surfaces could not be examined by probe, they reported interproximal lesions detectable only by radiographs in 28 percent, 47 percent and 64 percent of four, five and six-year-old children, respectively. Stephens *et al* concluded that routine bitewing radiographs remain a productive technique in initial dental examinations of young adults (ages thirteen to thirty), when they demonstrated that 89 percent of the patients examined had interproximal lesions, which were detectable only by bitewing radiographs.[10] They also showed that 51 percent of the interproximal lesions in these patients were detectable only with bitewing radiographs.

A survey of general practitioners revealed a range of intervals from six to twenty-four months for bitewing radiographs taken at recall visits.[11] Seventy-six percent of the general practitioners took bitewing radiographs at intervals of twelve months or less at recall visits. While bitewing radiographs have been shown to be effective in detection of interproximal caries at initial oral examinations, routine radiographic examinations at recall visits are difficult to support in light of current guidelines.

Studies indicate a relatively slow progression of interproximal lesions. Shwartz *et al* reported a period of twenty-four months for lesions to progress through enamel in primary teeth and approximately forty-eight months for lesions to progress through enamel in permanent teeth.[12] Zamir *et al* reported that the spread of a lesion from the surface of the tooth to the dentinoenamel junction took 26.4 months in permanent teeth of fourteen to fifteen-year-old patients, and 32.3 months for twenty-one to twenty-four-year-old patients.[13] Less than 20 percent of the lesions they observed reached the dentinoenamel junction in twenty-four months. Pitts reviewed studies that had monitored caries progression in posterior interproximal enamel surfaces.[14] Using a mathematical model he calculated a mean time of three to four years during which a lesion remains radiographically confined to enamel.

The purpose of this study was to determine an average interval between positive readings of interproximal caries on bitewing radiographs for pediatric dental patients seen at regular recall intervals.

METHODS AND MATERIALS

One thousand one hundred fifty-three pairs of bitewing radiographs representing retrospective data collected on 145 patients between the ages of two and fifteen years of age at their initial visit were reviewed for interproximal caries and other radiographically evident lesions. The sample included sixty-one males and eighty-four females. The patients were randomly selected from charts of a private pediatric dental practice, where they participated in a comprehensive preventive maintenance program. This included professional prophylaxes, oral hygiene instructions, topical fluoride applications and exposure to optimum levels of systemic fluoride.

The following criteria were used in selection and evaluation of cases. Each patient's chart contained at least four pairs of bitewing radiographs taken during a period of four years. Radiographs were read as sets, not as individual films. All films were evaluated with the aid of a viewbox in a dimly lighted room. Interproximal caries was recorded at the time of the radiographic evidence of a defect in the enamel.[15] Caries and other pathological lesions were recorded at their initial detection. A positive reading for interproximal caries superseded any criteria that would designate a pair of radiographs as nondiagnostic. Lesions other than caries were recorded, regardless of the diagnostic quality of the radiograph for interproximal caries detection.

The following criteria were used to judge the quality of each bitewing pair for diagnosis of interproximal caries. Radiographs were considered nondiagnostic for interproximal caries detection, if the distal contacts of the canines or the most distal contact areas of the quadrants were not clearly demonstrated. A pair of radiographs of a primary dentition was considered nondiagnostic for interproximal caries detection, if two or more contact areas were overlapped. A pair of radiographs of a mixed or permanent dentition was considered nondiagnostic for interproximal caries detection, if four or more contact areas were overlapped.

Before beginning this study, a pilot study was completed. Twenty-two cases were evaluated by the two

principal investigators, using the criteria listed above. The primary purpose of the pilot study was to assess the percent agreement between the two evaluators. The percent agreement for detection of interproximal caries was 79.1 percent. The percent agreement for lesions other than interproximal caries was 97.4 percent. Based on the level of these percent agreements, it was decided that radiographs in the study would be evaluated by either principal investigator. Each set of films was read once.

RESULTS

Diagnostic yield of radiographs

The 1153 pairs of bitewings demonstrated new interproximal lesions 32.0 percent of the time, while 50.1 percent of these sets showed no new interproximal lesions. Using the criteria of the study, 17.9 percent of the 1153 films examined were nondiagnostic for the detection of interproximal caries.

Average interval between positive readings

The average interval between positive readings for interproximal caries was calculated from data collected on individual cases. For all patients, without regard for stage of dentition, an interval of 17.7 months existed between positive readings. Table 1 gives the breakdown by stage of dentition.

The mean intervals for each stage of dentition were compared with each other dentition stage in a pair-wise analysis, using t-tests for dependent means. Intervals for patients demonstrating both stages of dentition being compared were selected for these analyses. Intervals which overlapped stages of dentition were not used. A summary of the pair-wise comparison of dentitions is presented in Table 2.

Table 1 ☐ Average positive bitewing intervals.

Dentition	Number of intervals	Average interval (mos.)
All	290	17.7±2.1*
Primary	51	15.9±3.0*
Mixed	58	14.8±2.1*
Permanent	14	15.0±2.6*

*95% confidence interval

Note: Some intervals used in calculation of the overall average interval (17.7 mos.) overlapped stages of dentition and were not used in calculation of average intervals for each dentition type.

Table 2 ☐ Pairwise comparison of dentition types.

Comparison	Average interval (mos.)	Difference (mos.)
Primary	16.3	3.6
Mixed	12.7	
Mixed	10.3	3.7
Permanent	6.6	
Primary	14.3	3.0
Permanent	11.3	

Differences were not statistically significant (all ps > .15).

Table 3 ☐ First pair of bitewing radiographs.

Reading	No. of Patients	Percent
Interproximal caries	65	44.8
No interproximal caries	58	40.0
Nondiagnostic film	22	15.2
Total	145	100.0

Correlation of average interval to interproximal caries at initial visit

An evaluation was made of interproximal caries detected at the initial visit. A summary of these findings is found in Table 3. Of those patients who did not have interproximal caries at the first visit, twenty-three developed no interproximal lesions in the course of the study. In the remaining thirty-five patients who were initially free of interproximal caries, an average interval of 18.5 months occurred between the initial bitewing examination and the detection of the first interproximal lesion.

A similar calculation was made for patients who had interproximal caries at the initial visit. Fifty-seven of these sixty-five individuals later experienced additional interproximal caries. The average interval between their first visits and the next positive readings for interproximal caries was 15.1 months. This comparison was also made within each stage of dentition (see Table 4).

These data were analyzed using 2 x 3 analysis of variance (ANOVA). No significant differences were found on the mean positive intervals between the groups which were carious or noncarious at the initial examination ($P = 0.878$). Nor was there a significant difference across dentition types in the groups ($P = 0.212$). The group by dentition interaction was also nonsignificant ($P = 0.687$).

Recurrence of interproximal lesions was followed by a positive reading at the next bitewing examination. One hundred fifty-five of the 365 positive readings (42.5 percent) were followed by a positive reading at the next evaluation.

Detection of lesions other than interproximal caries

Eight pairs of bitewings (6.9 percent) were diagnostic for some morbidity other than interproximal caries.

Table 4 ☐ Comparison of first positive intervals.

Dentition	Average first positive interval (mos) Proximal caries First visit	No proximal caries First visit
All	15.1	18.5
Primary	15.5	18.3
Mixed	14.2	19.9
Permanent	20.4	16.6

Differences not statistically significant (ps for all effects > .20).

Table 5 ☐ Frequency of morbidity other than interproximal caries.

Dentition	Frequnecy	Percent Frequency
Primary	2	6.9
Mixed	22	75.9
Permanent	5	17.2
All	29	100.0

Table 6 ☐ Lesions on all bitewing radiographs.

Morbidity	Frequency	Percent frequency
Ectopic eruptions	20	25.0
Caries (noninterproximal)	19	23.8
Periapical or interradicular morbidity	14	17.5
Ankylosis	7	8.8
Abnormal external resorption	2	2.5
Overretained root tip	2	2.5
Other*	16	20.0

*Includes all lesions seen only once

Twenty-nine of these eight bitewing pairs were radiographs that were free of interproximal caries detection. The majority of the twenty-nine cases were in the mixed dentition (see Table 5). The most frequently seen abnormalities were ectopic eruption, noninterproximal caries, periapical morbidity or involvement of the furcation, and ankylosis, in order of decreasing frequency (Table 6). Of the patients who never experienced interproximal caries, only one experienced any morbidity detectable on the bitewings. This patient had an ectopic eruption of a permanent mandibular lateral incisor.

For the initial visit, morbid states other than interproximal caries were found in twenty-five bitewing pairs. These twenty-five cases represented seventeen individuals who had interproximal caries and eight who did not. Lesions apparent on the initial sets of bitewings included noninterproximal caries, ectopic eruption, and ankylosis, in order of decreasing frequency.

DISCUSSION

Forty-five percent of the patients in this study demonstrated interproximal caries on the initial bitewing examinations. Of all bitewings taken at subsequent recall visits, 32 percent of the film pairs demonstrated interproximal lesions. These findings support the use of bitewing radiographs at initial examinations, as previously recommended by Stephens, who had reported that 89 percent of patients examined by bitewing radiographs on initial examination had interproximal caries.[10] When compared to the patients in this study, the patients in Stephens' study were older. Very few patients in Stephens' study had a lifetime exposure to systemic fluorides.

The average interval for positive findings on bitewing examinations of 17.7 months is consistent with recommendations of the conference, Radiation Exposure in Pediatric Dentistry.[2] Recommended differences in bitewing intervals for primary and permanent teeth were not supported, however, by this study. Intervals in primary, mixed, and permanent dentitions were not significantly different. The slow progression of interproximal lesions, even in primary teeth, suggests that periods longer than one year for all dentitions may be appropriate.[12]

It is generally accepted that patients with a history of caries are at greater risk for interproximal caries and should have semiannual radiographic examinations until caries-free.[2,3,4] The results of this study show that the average interval between the initial visit and the first interproximal lesion was 18.5 months for patients with no interproximal caries at the initial visit. For patients with interproximal caries at the initial visit an interval of 15.1 months passed before their next interproximal lesion was detected (Table 4). This finding suggests that a period longer than six months may be appropriate, even for patients with a history of caries. Although 42 percent of films taken immediately subsequent to positive readings were also positive for interproximal caries, some of these bitewings were taken at intervals longer than six months.

The proportion of nondiagnostic films in this study may seem high. A report by Sewerin, however, showed that 81 percent of interproximal surfaces on bitewing radiographs were overlapped.[16]

The diagnostic yield of other lesions was low and would not support the use of bitewing radiographs for this purpose alone. This is particularly true when one considers the types of lesions that were most often observed. Ankylosis, noninterproximal caries, and ectopic eruptions would most likely be detected clinically. Suspicion of periapical morbidity or involvement of the furcation should be raised by clinical findings or the dental history. A more selective use of radiographs to detect the presence of these lesions is appropriate.

CONCLUSIONS

- ☐ The average positive bitewing interval of 17.7 months is consistent with recommendations of twelve to twenty-four-month bitewing intervals reported in the literature.
- ☐ The use of shorter intervals for patients with primary tooth contacts is not supported by this study.
- ☐ Bitewing intervals longer than six months may be appropriate, even for patients with a history of caries.
- ☐ The routine use of bitewing radiographs for detection of other morbidity, exclusively, is not supported by the findings of this study.
- ☐ Further evaluation of selection criteria for the use of bitewing radiographic examinations is needed.

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INTERPRETING PHYSICAL BONE CHANGES OF JAW LESIONS

Radiographic findings of jaw lesions reflect the physical changes lesions induce in bone. However, film patterns of lesions are rarely pathognomonic; thus, the radiologist must carefully examine all the manifestations of the disease.

Film interpretations made from recollection of other similar-appearing lesions often lead to missed diagnoses and should be avoided. Consider the case of an asymptomatic 30-year-old black male who presented for a routine dental examination. Pantomograph revealed a cystlike radiolucency containing patches of calcification, but gross surgical findings demonstrated a bony defect filled with soft tissue, which was determined to be an ossifying fibroma.

Chomenko, A.G.: Atlas for maxillofacial pantomographic interpretation. Chicago: Quintessence Publishing Co., 1985, p 108.

The effects of primary molar ankylosis on root resorption and the development of permanent successors

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Thomas Zullo, PhD
Stephen Paulette, DDS

Ankylosis of teeth results from the fusion of alveolar bone with cementum and/or dentin and may occur at any time during or following active eruption. Ankylosed teeth maintain existing occlusal levels while adjacent teeth continue to erupt via deposition of alveolar bone. This may result in the clinical appearance of depression or submergence of ankylosed teeth below the occlusal plane.[1]

The association of ankylosed primary molars with various clinical problems such as delayed exfoliation, aplasia of succedaneous teeth, as well as the effects of ankylosis of primary molars on the formation of the succedaneous premolars have been reported empirically.[1,2]

The purpose of this study is to investigate the effects of ankylosis on root resorption of involved primary molars and the relationship to the root formation of their permanent successors.

REVIEW OF LITERATURE

Gluckman described a case of multiple ankylosed primary molars with two congenitally missing succedaneous teeth and one succedaneous premolar with no evidence of root formation.[3] Biederman, in 1962, 1964 and 1968, reported that primary teeth were ankylosed more frequently than permanent teeth, the ratio being more than ten to one.[4-6] The mandibular teeth were ankylosed twice as often as the maxillary teeth, and he also reported that the second primary molar was more frequently ankylosed than other primary teeth. Brearly and McKibben disputed Biederman's findings and concluded that the first mandibular primary molar was the most frequently ankylosed tooth.[2] They also stated that ankylosis of the mandibular second molars occurred very rarely before the eruption of the mandibular first permanent molar, whereas a high incidence of ankylosis of the first primary molars prior to the eruption of the first permanent molar was observed.

A correlation between the congenital absence of succedaneous teeth and ankylosis of their primary predecessors has not been statistically established. Yet, there have been speculations that, at least in selected cases, a higher incidence of aplasia existed.[1]

The correlation between ankylosis of primary teeth and root resorption and/or exfoliation has also been speculative. Brearly and McKibben stated that root resorption appeared to be within the anticipated limits, and most affected teeth showed a normal pattern of root resorption.[2] There was no attempt, however, to compare these observations to a control sample or to assess quantitatively the stages of root resorption. Their sam-

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ple included 124 teeth (65 percent) with no evidence of root resorption.

The prevalence of ankylosis in the primary dentition ranged from 2.0 percent to 7.9 percent in North American children, and may be as high as 24 percent in certain non-North American ethnic groups.[2,7]

MATERIALS AND METHODS

The patients for this study were selected from the outpatient Dental Clinic of Children's Hospital of Pittsburgh. A total of fifty-four healthy Caucasian children, ranging in age from six to fifteen years and exhibiting ankylosis of mandibular molars(s), were included. The sample consisted of twenty-two females and thirty-two males with a total of 125 ankylosed mandibular molars. The selection was based on the presence of one or more mandibular virgin ankylosed primary molars with a minimum of one millimeter of infraclusion. The extent of submergence was classified as slight, moderate or severe, according to the method described by Brearly and McKibben.[2] Control subjects were selected randomly from the remaining clinic population and were matched for age, sex, health status, and ethnic background. The control sample included twenty-six males and forty females. Good quality panoramic radiographs were available for all subjects.

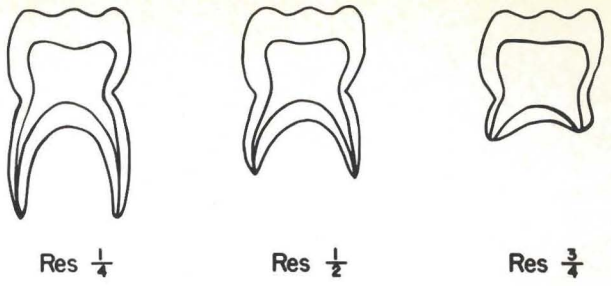
Root resorption was rated on a four-point scale, according to the method described by Moorrees and Fanning (Figure 1).[8] Root development of succedaneous teeth was rated on a five-point scale, according to the method described by Moorrees *et al* (Figure 2).[9] Both root resorption and root development were statistically analyzed by means of the Kurskal-Wallis H test, employing the modifications described by Marascuilo and Dagnais.[10] Root resorption in this method of analysis is defined as an ordered qualitative variable extending from one-fourth resorbed to exfoliation, whereas root development is defined as an ordered qualitative variable extending from root initiation to root completion. A single examiner rated the entire sample. A second judge repeated 156 measurements, involving thirty-three patients of the total sample. Inter-judge reliability, using the Pearson Product Moment Correlation, was found to be 0.94, thus indicating a high level of reliability.

FINDINGS

Table 1 depicts the distribution of the teeth that were identified as ankylosed.

For purposes of statistical analysis, data obtained from right and left molars were combined. Distinction was maintained, however, between first and second primary molars and between first and second premolars.

Figure 1



Chi Square Tests for Association were performed between root resorption and corresponding root development values. The results were found to be statistically significant at the 0.01 level, indicating a significant relationship between resorption of ankylosed teeth and root formation of their permanent successors.

The mean rank values for root resorption are illustrated in Tables 2 and 3. Statistically significant differences were found at the 0.05 level between the control and ankylosed subjects for the mandibular first primary molars. The ankylosed first primary molars exhibited a significant delay in root resorption (Table 2). For the mandibular second primary molars, no significant differences existed; examination of the raw data, however, indicated an obvious delay, primarily in the male ankylosed group (Table 3).

Statistically significant differences at the 0.05 level were found between the control and the ankylosed subjects for root development of the mandibular first premolars. The ankylosed group exhibited a significant delay in root formation (Table 4). For the mandibular second premolars, no significant differences existed between the control and the ankylosed groups. Statistically significant differences at the 0.05 level existed, however, between males and females. Female subjects of both groups exhibited a more advanced root development (Table 5). Again, examination of the raw data indicates the presence of a marginal delay, which was not statistically significant.

The majority of ankylosed teeth included in this sample exhibited slight infraclusion (65.6 percent). Moderate infraclusion was encountered in only 27.2 percent of the sample. Severe infraclusion was infrequent and only involved 7.2 percent of the sample.

Figure 2

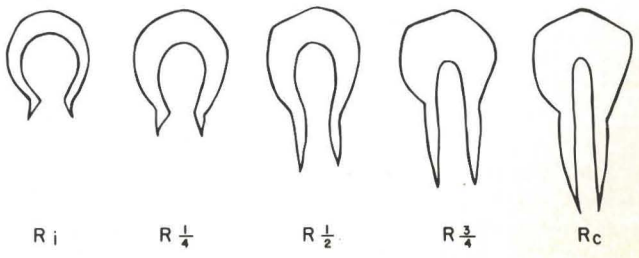


Table 1 ☐ Number and percentage of cases with ankylosis.

Primary teeth	Male				Female			
	(N = 32)				(N = 22)			
	Ankylosed		Normal		Ankylosed		Normal	
	N	%	N	%	N	%	N	%
Mandibular left first molar	19	59	13	41	17	77	5	23
Mandibular left second molar	22	69	10	31	8	36	14	64
Mandibular right first molar	16	50	16	50	17	77	5	23
Mandibular right second molar	18	56	14	44	9	41	13	59

Table 2 ☐ Mean rank values of root resorption for the mandibular first primary molars.

Sex	Control	Ankylosed
Male	96.68 (52)*	83.07 (35)
Female	113.23 (80)	94.14 (33)
Total	106.71	88.44

Chi Square = 8.35
$P < .05$
* values in parantheses indicate number of teeth

Table 3 ☐ Mean rank values of root resorption for the mandibular second primary molars.

Sex	Control	Ankylosed
Male	89.79 (52)	82.06 (40)
Female	101.33 (78)	101.33 (17)
Total	96.71	87.81

Chi square = 5.06

Table 4 ☐ Mean rank values of root development for the mandibular first premolars.

Sex	Control	Ankylosed
Male	101.31 (52)	88.71 (34)
Female	114.66 (79)	75.23 (34)
Total	109.36	81.97

Chi square = 13.65
$p < 0.005$

Table 5 ☐ Mean rank values of root development for the mandibular second premolars.

Sex	Control	Ankylosed
Male	80.34 (52)	87.32 (38)
Female	104.16 (80)	102.88 (17)
Total	94.78	92.13

Chi square = 8.01

DISCUSSION

The association of ankylosis of primary teeth with various complications such as delayed exfoliation or overretention, deflection of succedaneous tooth buds or aplasia of the permanent successors has been suggested empirically.[1]

This study was designed to assess the effects of ankylosis of primary mandibular molars on their rate of root resorption and the root formation of their succedaneous teeth. The results of this study indicated that a statistically significant correlation existed between root resorption of ankylosed molars and root formation of succedaneous teeth. This finding indicates that delayed root resorption secondary to ankylosis is likely to delay root development of the permanent successor. It can be hypothesized, therefore, that ankylosed teeth with significant delay in root resorption should be candidates for extraction and space maintenance in an attempt to reverse the negative impact of ankylosis on the developing tooth bud.

The root resorption as well as root formation and eruption pattern of the permanent successor should be monitored periodically, if ankylosed teeth are maintained.

Other findings of this study indicated a nonconclusive trend. The ankylosed first primary molars and their successors showed a significant delay in root resorption and root development, respectively, whereas the ankylosed second primary molars and their successors showed only an insignificant delay. The marginal delay of the second primary molars could be the result of what Brearly and McKibben described as the later onset of ankylosis affecting second molars when compared to first molars.[2]

These findings, although inconclusive, indicate a need to study the correlation between the severity of ankylosis and root resorption. Until more conclusive evidence is determined, ankylosed primary molars should be considered at risk for delayed resorption and should, therefore, be monitored carefully.

CONCLUSIONS

- ☐ A statistically significant relationship at the 0.01 level existed between root resorption of ankylosed mandibular primary molars and root formation of their permanent successors.
- ☐ The ankylosed first primary molars and their permanent successors showed a statistically significant delay in root resorption and root development.
- ☐ The ankylosed second primary molars and their

permanent successors showed a marginal delay in root resorption and root formation. This delay, however, was not statistically significant.

□ Ankylosed mandibular molars and their permanent successors should be evaluated periodically for a possible delay in root resorption and root development.

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This study was presented at the 63rd Annual Session of the International Association for Dental Research in Las Vegas, NV, March 1985.

PREMOLARS

Embedded premolars are almost always second premolars. Rarely does the first premolar fail to erupt. The causes of noneruption of the maxillary and mandibular premolars are largely similar.

The most common cause of noneruption is the premature loss of the primary second molar. Its loss permits the permanent first molar to move forward into a position where it will obstruct and prevent eruption of the second premolar. Prolonged retention of the primary second molar as a result of ankylosis or failure of its roots to resorb sometimes serves as an obstruction. The direction of the second premolar may be diverted, or if removal of the obstruction is delayed too long, the premolar may fail to erupt even though it has remained in its normal position for eruption. Many premolars may fail to erupt as a result of disorientation of the tooth germ, and this is particularly true of the maxillary second premolar, where complete inversion is not an unusual occurrence.

Gibilisco, J.A.: Stafne's oral radiographic diagnosis, Philadelphia: W.B. Saunders Co., 1985, pp 49-50.

Fractured permanent incisors among Nigerian school children

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Although much has been written about fractured incisors in children, the subject continues to generate a lot of interest because of peculiar local differences which exist around the world.

The purpose of this survey is to:

- ☐ Assess the prevalence of fractured incisors in Nigerian school children.
- ☐ Investigate the etiological factors involved.
- ☐ Assess the types of treatment received.
- ☐ Suggest solutions to the problem.

MATERIALS AND METHODS

Children, ages ten to seventeen years from five secondary schools in Ibadan, Nigeria, were included in the survey. All 2,979 were examined by the same operator, using natural light, a dental mirror, and probe.

The students' names, ages and sex were recorded. The presence of an injured incisor was recorded, indicating fracture of the crown, discoloration, or displacement. Tooth loss through trauma was also recorded. The cause of injury; the teeth affected; the class of fracture; presence of pain, swelling or sinus; time interval between injury and examination; and the type of treatment received were also noted.

A vitality test, using a battery-operated electric pulp tester,* and a periapical radiograph were made, when a tooth was discolored or a sinus was present. Previous attendance at hospitals and dental clinics was also recorded.

The three distinct classes of coronal tooth fracture based on the classification of Ellis are depicted in the Figure below.[1]

Classification

Class I: Fracture involving enamel only.
Class II: Fracture involving enamel and dentin.

*Pelton Crane, Charlotte, N.C.

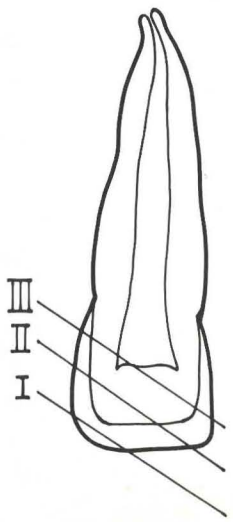

Figure. Diagrammatic representation of fractures involving the crown of a tooth.

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He would like to thank the principals, staff and students of the five schools surveyed for their cooperation and hospitality while this investigation was in progress.

Table 1 ☐ Number of school children examined by age and sex (10-17 years).

Age	Male	Female	Total
10	6	3	9
11	35	33	68
12	130	157	287
13	284	415	699
14	316	384	700
15	263	297	560
16	199	224	423
17	105	128	233
10-17	1,338	1,641	2,979

Class III: Fracture involving enamel and dentin with pulpal exposure.

The significant findings are presented in Tables 1-7.

RESULTS

The age and sex distributions of the sample are presented in Table 1. The types of injury sustained are fracture, discoloration and avulsion. Table 2 shows the incidence of these injuries and compares the situation in boys and girls. The prevalence of fractured incisors compared with the 13 percent recorded for American children in Washington, but is much higher than other reports for the United States, Japan, England, Scotland, Jerusalem, and New Zealand.[1-4,6-9]

In Table 3, the greatest incidence of fracture occurs at fourteen years of age. The male to female ratio of 1.5:1 compares with the 1.6:1 reported by Hallett, but is less than that reported by other authors.[1,4,6,10-12]

Table 2 ☐ Incidence of trauma.

	Children examined	Fracture	Number showing discoloration	Avulsion	Total
Males	1,338	232	10	10	252
Females	1,641	190	13	21	224
Total	2,979	422(14.17%)	23(0.77%)	31(1.04%)	476(15.98%)

Table 3 ☐ Incidence of individuals showing fractures grouped according to age, sex and percentage.

Age in years	Male Examined	Male Fractured	Male Percent	Female Examined	Female Fractured	Female Percent
10	6	0	0	3	0	0
11	35	4	11.43	33	2	6.06
12	130	24	18.46	157	18	11.46
13	284	49	17.25	415	40	9.64
14	316	64	20.25	384	56	14.58
15	263	49	18.63	297	36	12.12
16	199	33	16.58	224	28	12.50
17	105	9	8.57	128	10	7.81
10-17	1,338	232	(17.34%)	1,641	190	(11.58%)

Table 4 confirms that the upper central incisor is the tooth most frequently involved in fractures. The right and left upper central incisors are about equally affected and together account for over 80 percent of the fractures. The frequency of 94.23 percent for fractured maxillary incisors compares with that reported by Zadik *et al.*[8] Table 4 also shows that Ellis Class I or enamel fracture is the most common type encountered. This is similar to Grundy's finding, but contrasts with other reports.[2,4,8,10,11]

In Table 5, falls rather than sports are the predominant etiological factor, while removing metallic bottle tops with the teeth accounts for some 4 percent of the fractures.

Table 6 compares attendance at dental clinics and hospitals. It is distressing that just 10.94 percent of the students have ever been to a dentist, as compared with the over 70 percent who have had contact with a physician.

In Table 7, we see that the most common reason for attendance is tooth extraction, implying that pain is the motivating factor. Unfortunately, only three students with fractures (less than 1 percent) received dental treatment. One received root canal treatment, while the other two received composite restorations.

Table 4 ☐ Frequency and percentage of tooth involved, and number in each class of fracture.

Tooth	Class of fracture I	II	III	Frequency	Percentage
|1	131	92	3	226	42.00
1|	121	84	8	213	39.59
|2	29	14	0	43	7.99
2|	11	14	0	25	4.65
|1	5	4	1	10	1.86
1|	2	3	0	5	0.93
|2	4	5	1	10	1.86
2|	3	3	0	6	1.12
Total	306(56.88%)	219(40.70%)	13(2.42%)	538	100%

Table 5 ☐ Summary of causes.

Cause	Number of cases	Percent
Falls	321	76.06
Fights	41	9.72
Sports	27	6.40
Removing bottle top with the teeth	17	4.03
Bit on bone	7	1.18
R.T.A.	5	1.66
Walked into door	3	0.71
Lifting bucket with teeth	1	0.24
	422	100

Table 6 ☐ Attendance at the dental clinic as compared with the hospital.

	Dental clinic	Percent	Hospital	Percent
Attendance	326	10.94	2,116	71.03
Nonattendance	2,653	89.06	863	28.97
Total	2,979	100.00	2,979	100.00

Table 7 ☐ Reasons for attendance at the dental clinic.

Reasons	No. of cases	Percent
Check-up	120	36.81
Scaling and polishing	15	4.60
Extraction	156	47.85
Root canal treatment	1 (1)	0.31
Filings (a) Silver Amalgram	30	9.20
(b) Composite	2 (2)	0.61
Denture	2	0.61
Total	326	100.00 (99.99)

DISCUSSION

There is a relatively high incidence of fractured incisors in Nigerian school children, mostly as a result of falls. This is not confined to the school playground, and is most likely due to the rough terrain in this part of the world. The preponderance of fractures in males is due to their more boisterous outdoor activity, while the prominent position of the maxillary incisors in the face is responsible for their more frequent involvement in fractures than the lower teeth. Fracture of the anterior teeth is a major problem in children, because improper handling of these emergencies could result in the unnecessary loss of teeth. This could alter the child's appearance, interfere with occlusion and speech, and give rise to such habits as tongue thrusting. Developments such as these, in the long run, could constitute a psychological hazard, which may affect the emotional development of the child.

This problem is further compounded here because of the low dentist-to-population ratio and the apathy toward dental treatment. This apathy is due in part to a fear of dental treatment, but more significantly to unawareness of where to seek treatment. Measures will have to be taken to educate both parents and children on the importance of regular dental check-ups and prompt dental treatment. Bad habits such as removing bottle tops with the teeth should be discouraged, while the use of mouth protectors during contact sports, to reduce dental injuries, should be given some consideration as this has been found effective in some parts of the world.[13-17] Furthermore, efforts would have to be geared toward formulating a comprehensive school dental health progam that would make optimum use of available personnel.

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Incidence of an accessory distal root on mandibular first permanent molars in Hispanic children

Robert Steelman, DMD

The presence of supernumerary roots on maxillary and mandibular third molars is common. Accessory roots on the mandibular first permanent molar have been infrequently reported and most studies of this anomaly have been directed toward various ethnic groups. Reichart studied 364 Thai patients who had the mandibular first permanent molar extracted and found the incidence of an accessory distal root to be 19.23 percent.[1] Souza-Freitas reported the incidence of accessory distal rooted mandibular first permanent molars in children of European and Japanese descent to be 4.2 percent and 22.7 percent, respectively.[2] Pindborg reported that 20 percent of Mongolians and 1 percent of Caucasians have an extra distal root on the mandibular first permanent molar.[3] Reichart cites a study in which the incidence of an accessory distal root on mandibular first permanent molars was 3.4 percent in English Caucasians.[1] Tratman studied the Chinese, Malayans, and Japanese, and Eurasians, and found the incidence of three rooted mandibular first permanent molars to be 8 percent, 11.7 percent and 5.4 percent, respectively.[4]

Since there are no studies on the incidence of an accessory distal root on mandibular first permanent molars in Hispanic children, a survey was conducted to determine the incidence of such molars in this ethnic group.

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MATERIALS AND METHODS

There are approximatley 1,300 Hispanic children, eight to fourteen years of age, registered for medical and dental care at Children and Youth Project community clinics in West Dallas. From this age-group, 156 children (seventy-three males and eighty-three females) were selected for this study. Each child had received, or is currently receiving, dental care. A complete intraoral series of radiographs was made for each child and from each series the right and left periapical views of the first permanent mandibular molar were examined to determine the presence of an accessory distal root. In all cases selected, the angle of the exposure made the presence of an accessory distal root readily discernible, if present (Figure).

RESULTS AND DISCUSSION

The table shows the number and incidence of Hispanic children with an accessory distal root on the mandibular

Table ☐ Number and incidence of children with an accessory distal root on a mandibular first molar.

Sex	Number	3RMM* Right	%	3RMM* Left	%	3RMM* Bilateral	%	Total	%
Male	73	2	2.7	1	1.4	3	4.1	6	8.2
Female	83	2	2.4	0	0	2	2.4	4	4.8
Total	156	4	2.6	1	0.6	5	3.2	10	6.4

*Three-rooted mandibular first permanent molar

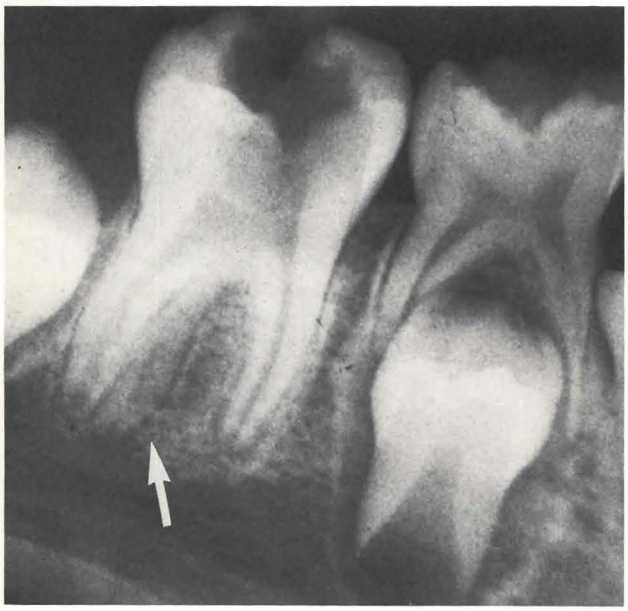

Figure. Accessory distal root on the mandibular right first permanent molar in a nine-year-old Hispanic female. Note the presence of a pulp canal in the accessory root.

first permanent molar. Results have been tabulated individually for both males and females as well as collectively. In all cases, percentage values have been rounded to the nearest tenth. There were six males and four females found to have an accessory distal root on the mandibular first permanent molar, resulting in an incidence of 8.2 percent and 4.8 percent, respectively. Collectively, the overall incidence was 6.4 percent. Bilateral accessory rooted mandibular first permanent molars occurred in 50 percent of those children affected (5/10). Among the five unilateral occurrences, the left mandibular first molar had the lowest incidence of a distal accessory root (0.6 percent). The incidence of a distal accessory root on the mandibular right first permanent molar was not only four times that of the left, but the incidence of occurrence of such a root was about the same for both males and females (2.7 percent and 2.4 percent, respectively).

The results of this survey, among a Hispanic population, are similar to other published studies concerning the incidence of an accessory root on mandibular first permanent molars. There are, however, two findings that are noteworthy: first, the overall incidence of 6.4 percent reported in this study is greater than the incidence reported in Caucasians (1 percent - 3.4 percent), Europeans (4.2 percent), and Eurasians (5.4 percent); and lower than reported incidences in Mongolians (20 percent), Thai (19.23 percent), Chinese (8 percent), as well as Malayans and Javanese (11.7 percent); second, Souza-Freitas stated that the probability of a bilateral occurrence of 50 percent exists for this anomaly.[1-4] This study supports a 50 percent bilateral occurrence.

The opinions on the etiology of an accessory distal root on the mandibular first permanent molar favor heredity. Tratman considers the presence of an accessory root to be a sex-linked dominant character.[4] Marder, in Zegarelli, states that extra roots may arise due to an evagination of the enamel organ and usually has a hereditary basis.[5] Reichart considers the accessory distal root to be a genetically determined racial trait.[1]

Clinically, the presence of accessory roots is very important. The roots must be identified, because failure to do so may compromise endodontic therapy or, in the case of exodontia, fracture of the root may be the cause of future infection, if allowed to remain in the alveolar bone.[1]

CONCLUSIONS

This study has shown that the incidence of an accessory distal root on mandibular first permanent molars in Hispanic children is greater than that reported for Caucasians, Europeans, and Eurasians, but less than other ethnic groups. The study supports the probability that such molars occur bilaterally, 50 percent of the time. Endodontic and exodontic procedures should be planned and performed with utmost care on mandibular molars with accessory distal roots.

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Case reports

The single maxillary central primary incisor: report of case

Sabine C. Maréchaux, DDS

Of the numerous studies on the prevalence of hypodontia in the permanent dentition, Silverman *et al* compiled a table of nineteen authors, from 1936 to 1973, which indicated a variation of 2.3 percent to 10.2 percent among the evaluations made from samples of 353 to 36,000 children, with an age range of three to eighteen years.[1] In their study, hypodontia was present in 4.34 percent of the cases examined, and of these, the tooth which was missing least frequently, was the maxillary central incisor (0.66 percent of all the hypodontias), while the mandibular first premolar was never absent.

Studies of hypodontia in the primary dentition are less frequent. Bennett *et al* compiled a table from the reports of six authors for the period from 1938 to 1971, all of which presented a frequency of less than 1 percent (0.1 percent to 0.9 percent).[2] This was confirmed by subsequent studies by Brown in 1974 and Järvinen *et al* in 1981.[3,4]

Hypodontia in the permanent dentition is most frequently found in the maxillary and mandibular second premolar and maxillary lateral incisor regions.[1] In the primary dentition, however, it appears to be restricted to the incisor region, with the exception of cases of ectodermal dysplasia.[2] The etiology of hypodontia has been attributed to heredity, endocrine and developmental disturbances, ectodermal dysplasia, Down's syndrome, cleft lip and palate, and local factors such as

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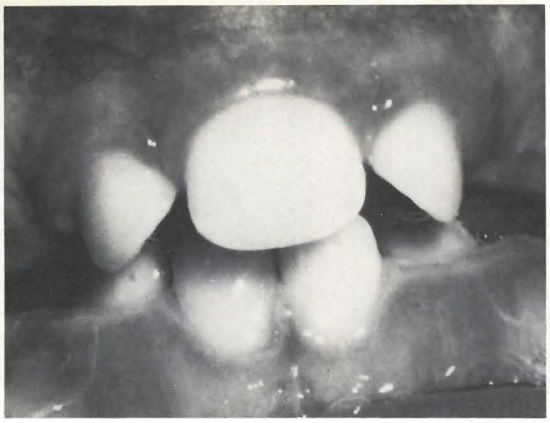

Figure 1. Clinical picture of a solitary maxillary primary central incisor of a boy age 1.5 years.

Figure 2. Apical radiographs showing the dental development in the maxillary incisor region. There appears to be only one tooth bud for the maxillary permanent central incisor.

infections and excessive exposure to radiation.[5] The absence of one maxillary central incisor is exceedingly rare and should be differentiated from early traumatic loss or connation of tooth germs.

LITERATURE REVIEW

The single maxillary central incisor syndrome was reported as a case report in the permanent dentition only, by Scott, Kopp, Fulstow and Lowry, since the patients were examined after the exfoliation of the primary maxillary incisors.[6-9] The case report of Kopp presents the syndrome in the mother and daughter.

Ellisdon *et al*, Holm *et al*, Wesley *et al*, Small, Hayward and Santoro *et al* present cases of a single maxillary central incisor in the primary and permanent dentition.[10-16] The total number of cases reported between 1958 and 1983 is twenty-one, of which fourteen were female and seven were male. No case has been reported of a single maxillary primary central incisor with two permanent maxillary central incisors as successors.

Rappaport *et al* state that the syndrome may be associated with a growth hormone deficiency and that two out of the five of their seven cases, which were of short stature, responded to growth hormone therapy.[12] Fulstown, Ellisdon *et al* and Hayward also state that their cases presented a short stature, so that out of the twenty-one cases described in the literature, eight are associated with short stature.[8,10,15].

Wesley *et al* and Santoro *et al* recommend, since this association is not always present, that the growth and development of the patient should be followed before initiating growth hormone evaluation and possibly therapy.[13,16] Other anomalies such as congenital heart disease, microcephaly, scoliosis, respiratory diseases, ectodermal syndromes and midline deformities have been reported to be associated with the single maxillary central incisor syndrome, but the term "Mono-superocentroincisivodontic dwarfism" by Rappaport *et al* seems to be too restrictive for this rare phenomenon.[8,12,13]

The following Table summarizes the literature review:

Year	Author	Permanent dentition	Primary dentition	Stature	Other anomalies
1958	SCOTT	1 female	—	—	—
1967	KOPP	2 females	—	—	—
1968	FULSTOW	1 female	—	1 short	Congenital heart disease, scoliosis microcephaly
1970	ELLISDON et al.,	—	1 male 1 female	1 short	Ectodermal anomalies, webbed toes etc.
1972	HOLM et al.,	—	1 male	—	Genetic family study indicating other hypochondrias
1974	LOWRY	1 female	—	—	Mild hypotelorism
1977	RAPPAPORT et al.,	—	3 males 4 females	5 short	Midline deformity respiratory infections
1978	WESLEY et al.,	—	1 male 1 female	—	Male — Vater syndrome.
1979	SMALL	—	1 female	—	—
1979	HAYWARD	—	1 male	1 short	Ocular hypoteliorism
1983	SANTORO et al.,	—	2 females	—	Missing left cochlea
		21 cases	14 females 7 males	8 short stature	

CASE REPORT

In June 1982, a boy, age 1.5 years, came for consultation to the Pedodontic Clinic of the University of Geneva Dental School. His mother was concerned about the noneruption of one maxillary central primary incisor.

Figure 1 illustrates the clinical picture with the eruption of all the primary incisors except for one maxillary primary central incisor. There was no history of previous trauma and both family and medical history were noncontributory. It was possible to take three apical radiographs (Figure 2), which show the physiological development and eruption of the maxillary primary incisor region. The boy appeared to be of average height for his age and his pediatrician reported normal development. In June 1983, the patient returned for his control check-up. Figure 3 shows that all of the primary

Figure 3. Clinical situation at age 1.5 years. There is crowding in the mandibular primary incisor region.

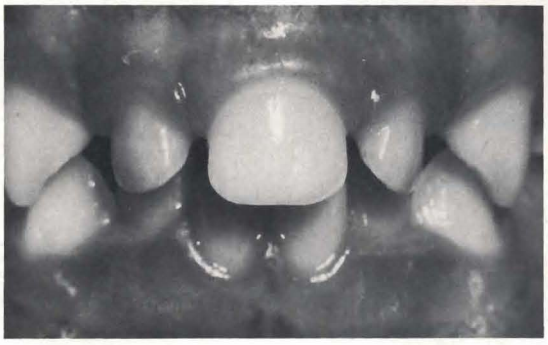

Figure 4. The canine relationship is Class I with spacing in the maxillary primary incisor region.

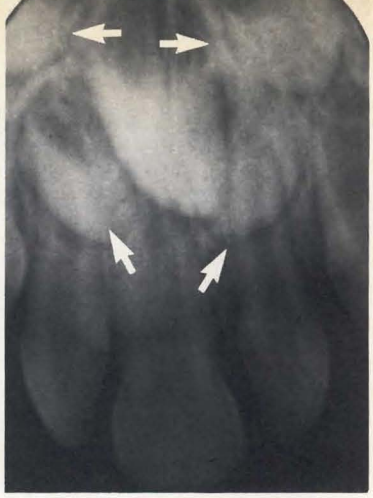

Figure 5. Apical radiograph at age 2.5 years, indicating the presence of a single maxillary primary and permanent central incisor. The tooth buds of both maxillary permanent lateral incisors and canines are present.

teeth have erupted, with crowding in the mandibular primary incisor region. The primary canines have erupted in a Class I relationship (Figure 4). Due to the absence of one maxillary central incisor, there is a loss of space in the maxillary intercanine region, which subsequently causes the crowding in the mandibular primary incisor region. The apical radiograph indicates the presence of only one maxillary permanent central incisor (Figure 5).

In November 1983, a panoramic radiograph showed a normal dental developmental status for a child age three, with the exception of the absence of one maxillary primary and permanent central incisor. His height at this time was 95 cm, which is within the normal range for his age and weight. Neither his parents nor his two brothers had any dental anomalies. Since the parents were not too concerned about the aesthetic appearance of a single central incisor, they decided to wait until the eruption of the permanent dentition for eventual orthodontic alignment and replacement of a single maxillary permanent central incisor. It should be mentioned that the orthodontic treatment of this case is not financed by the dental insurance. The family is of North African origin and excessive dental costs are not within their financial means. The patient continues to come for his routine dental check-ups and his growth is within the normal range.

DISCUSSION

The case that has been presented is an example of a single anomaly which is not apparently associated with any other anomalies. The patient is of normal height for his age and his pediatrician confirms that he is within the normal range for his development.

It should be noted that in cases of the solitary maxillary incisor, the tooth is always present in the midline, like a mesiodens, and that the morphological structure is symmetrical, and the mesial and distal surfaces are identical; but the crown and root of the tooth are the size of a normal central incisor. While the phenomenon is very rare, it should be assessed for future orthodontic and prosthetic treatment, if the aesthetics is to be corrected.

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Garre's osteomyelitis: report of case associated with a granuloma

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Chronic osteomyelitis with proliferative periostitis was first described by Carl Garre in 1883.[1] His paper dealt with the thickening of the periosteum of the anterior surface of the tibia secondary to chronic irritation. Involvement of the facial skeleton was first described by Pell in 1955, the mandible being the site of predilection.[2] Other names currently in use for this condition are periostitis ossificans, nonsuppurative ossifying periostitis, osteomyelitis sicca, and osteomyelitis with proliferative periostitis.[3]

Clinically, this condition usually presents as a unilateral facial asymmetry in children or adolescents. Eisenbud reports of a rare instance in which four quadrants simultaneously presented with Garre's.[4] There is no sex predilection and the mandible seems to be involved exclusively. The patient usually presents with a palpable non-tender bony enlargement of the lateral mandible associated with a carious tooth.[5] Rarely, this lesion will be associated with a periodontally compromised tooth. Radiographs are not pathognomonic but one may see an onion skin appearance of the mandible, secondary to successive depositon of new bone. A sunray appearance is observed, if bone is deposited perpendicular to the lateral cortex.

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Histopathology reveals a supracortical, subperiosteal deposition of reactive bone and osteoid with osteoblastic rimming.[6,7] The interweaving fibrous tissue is infiltrated with inflammatory cells consisting of lymphocytes and plasma cells.

The differential diagnosis of Garre's osteomyelitis is extensive. The Table [*page 128*], adapted from Eversole *et al*, is a list of conditions that should be included in differentiating a neoperiostosis.[8]

The treatment of Garre's osteomyelitis usually consists of elimination of the sources of infection, i.e., either extraction of an offending infected tooth or root canal therapy. This treatment almost always results in resolution of the proliferative osteomyelitis. Resistant cases have involved secondary surgery, i.e., decortication and sequestrectomy.

In rare cases, hyperbaric oxygen therapy, before and after survey, has been used as an adjunct to conventional treatment.[9]

CASE REPORT

On August 12, 1983, a six-year-old black male presented to the oral surgery outpatient facility of Thomas Jefferson University Hospital for evaluation of a left mandibular swelling. According to his mother, the swelling initially appeared four weeks prior to our initial examination, but over the past two weeks it had increased in size. She denied any history of trauma, animal contacts, chills, fever, malaise, or dysphagia. The review of sys-

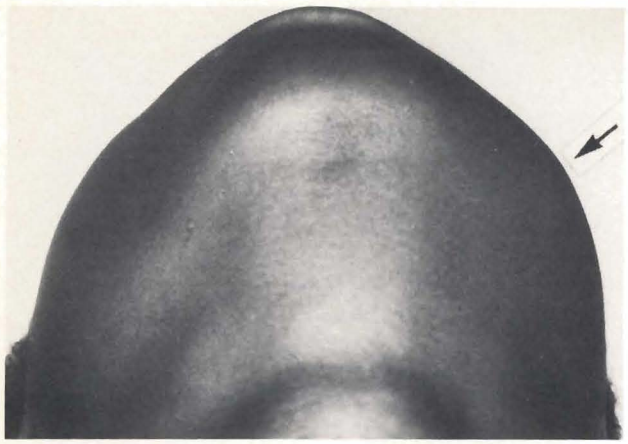


Figure 1. Submental photograph illustrating facial asymmetry with left facial swelling.

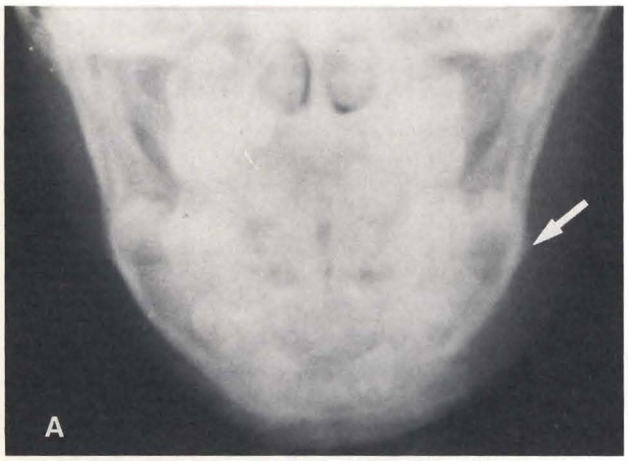


Figure 2A. P-A cephalometric radiograph showing left facial asymmetry and reactive bone.

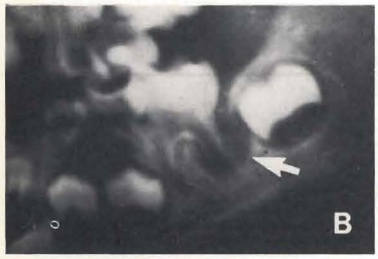


Figure 2B. Panoramic radiograph showing lucency in the area of the distal part of the mandibular first molar.

tems and the medical history were noncontributory. The only positive finding was a recent iron deficiency with unknown cause. Treatment consisted of oral ferrous sulfate therapy.

Examination revealed a well developed, well nourished black male in no acute distress. He was in the mixed dentition stage with no obvious caries. There was a firm 3x3 cm swelling in the mandibular left buccal vestibule adjacent to the first permanent molar. This was associated with left facial asymmetry (Figure 1). The overlying mucosa was without ulceration or inflammation. The mandibular left primary second molar and

- Developmental
  - Infantile cortical hyperostosis of Caffey
  - Infantile colic associated with hyperostosis
- Metabolic
  - Fluorosis
  - Avitaminosis C
- Reactive
  - Hypertrophic osteoarthropathy associated with:
    - Pulmonary disease
    - Renal disease
    - Polyarteritis nodosa
    - Dysproteinemia
    - Subperiosteal hematoma
- Inflammatory
  - Syphilitic osteomyelitis
  - Salmonella osteomyelitis
  - Nonspecific suppurative osteomyelitis
  - Rheumatoid arthritis
- Neoplastic
  - Nonosseous
    - Bronchogenic carcinoma
    - Liver cancer
    - Leukemia
    - Metastatic neuroblastoma
  - Osseous
    - Ewing's sarcoma
    - Osteogenic sarcoma

permanent first molar were vital to pulp testing. A periodontal probe examination did not reveal increased pocket depth or probe-induced purulent drainage. Panorex revealed a well delineated radiolucency along the distal root of the mandibular left first permanent molar; a P-A cephalometric radiograph showed an area of cortical expansion adjacent to the first molar, similar to that discernible in an occlusal radiograph (Figures 2A and 2B). The top three differential diagnoses at this time were:

- ☐ Odontogenic cyst vs granuloma with or without
- ☐ Garre's osteomyelitis
- ☐ Neoplasm (esp. histiocytosis X vs Ewing's sarcoma)

The plan was to admit the patient for excisional biopsy.

On August 15, 1983, the patient was admitted to Thomas Jefferson University Hospital and received preoperative laboratory studies of CBC, PT, PTT, UA and sedimentation rate. He was seen by the Pediatric Service for preoperative medical evaluation. His admission history and physical examination were significant only for iron anemia for the past month. He was receiving a dietary iron supplement. Preoperative laboratory values were within normal limits except for a mild anemia; hemoglobin and hematocrit of 11.0 gms/dl and 33.3

Figure 3. Note circular defect in lateral cortex of mandible with associated soft tissue occupying the excised bony defect.

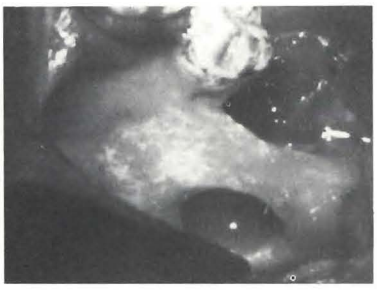


Figure 4. Lower left first molar was extracted and the soft tissue occupying the bony defect was excised.

percent, respectively, and an increased lymphocyte count of 51 percent.

On August 16, 1983, under general anesthesia, surgical excision of the lower left first permanent molar, excision of the soft tissue occupying the bony defect and biopsy of the mandible in the area of reactive bone was performed (Figures 3, 4). The patient tolerated the procedure well and was placed on routine postoperative care plus Aq. PCN 500,000 units IV Q 6h. He remained afebrile postoperatively and was discharged on the evening of August 17, 1983, with followup appointments in the outpatient facility.

One month postoperatively, the patient showed progressive intraoral healing and a decrease in the left mandible swelling. Radiographs also showed a decrease in the cortical expansion adjacent to the first molar. The extracted first molar was decalcified and sectioned and stained with hematoxylin and eosin. Microscopic examination showed a vital pulp with normal vascular and neural elements (Figure 5).

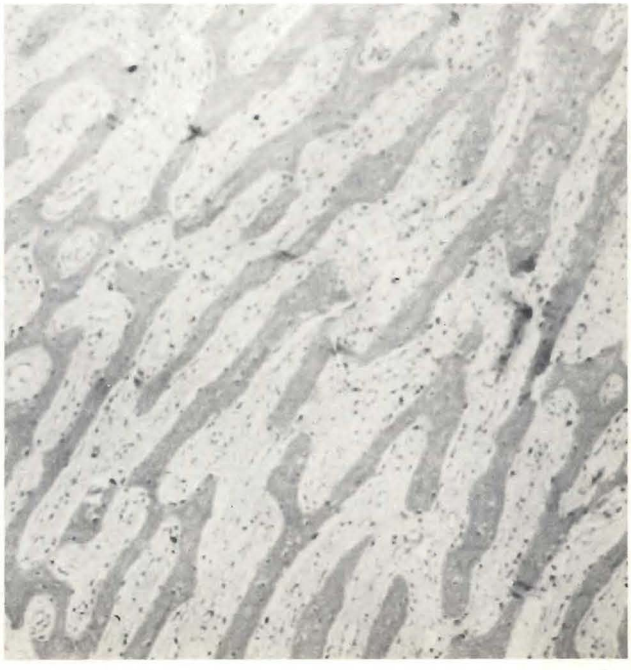
Histopathology of the bone biopsy revealed areas of reactive bone with osteoblastic rimming. The bony trabeculae were lined up in layers (Figure 6). There was also an inflammatory infiltrate. The soft tissue enucleated in the bony defect was consistent with granulation tissue (Figures 7A, 7B). The diagnosis was Garre's osteomyelitis and granuloma.

DISCUSSION

Garre's osteomyelitis is described as a supracortical deposition of reactive bone, secondary to chronic irrita-

Figure 5. Medium power photomicrograph of the sectioned extracted tooth, illustrating vital pulp with endothelial cell-lined blood vessels, normal neural elements and normal odontoblastic layer. Stained with hematoxylin and eosin-decalcified section.

Figure 6. Biopsy specimen of reactive bone from mandible showing bony trabeculae lined up in parallel layers with active osteoblastic proliferation. Medium power decalcified section stained with hematoxylin and eosin.



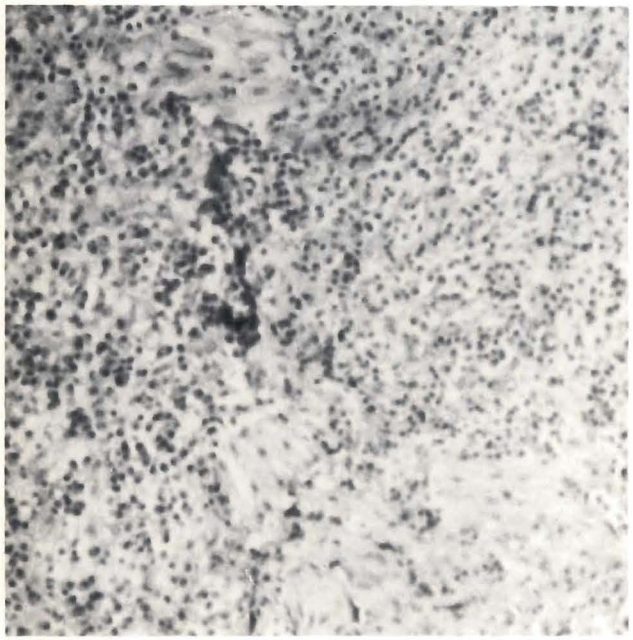


Figure 7A. Low power photomicrograph of the soft tissue excised from the bony defect of the mandible consistent with granulation tissue.

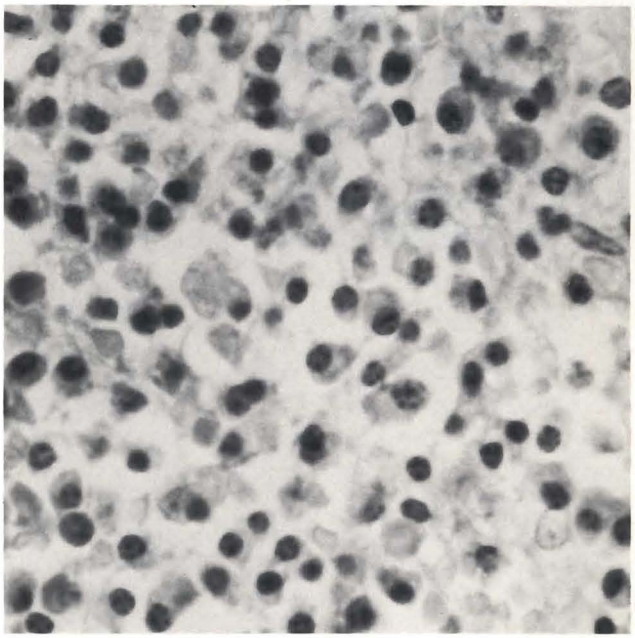


Figure 7B. High power of same specimen showing cellular elements of lymphocytes and plasma cells consistent with granuloma. Both stained with hemotoxylin and eosin.

tion. The irritation is usually due to an infected carious tooth. This case was unusual in that the dentition was free of caries, but there was a granuloma at the distal aspect of the first molar root. The probable sources of this lesion are (1) remnants of the developing odontogenic follicle of the first molar; (2) a lateral periodontal cyst that has degenerated and formed a granuloma. Potential sources of cyst epithelium include the cell rests of Serres, the rests of Malassez, or the epithelial cuff that migrates apically to cover cementum deep to the cementoenamel junction.[10]

The granuloma then became secondarily infected as is evidenced by the increased lymphocyte count and a positive culture identified as *bacterioids oralis*. This was associated with erosion of the lateral cortical plate of the mandible. The periosteum remained intact and the irritation caused a periosteal reactive bone formation consistent with Garre's osteomyelitis.

In summary, clinicians should be aware that although Garre's is usually associated with and the result of carious teeth there can be other causes of a proliferative periostitis. The differential diagnoses presented in this article serve as a guideline to use in assessing cases that present with similar clinical and radiographic findings.

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Dental management of oculodentodigital dysplasia: report of case

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Oculodentodigital dysplasia (ODD), also known as oculodento-osseous dysplasia, was first reported by Lohmann in 1920 and described in 1957 by Meyer-Schwickerath *et al.*[1,2] The syndrome includes the following characteristics:

- ☐ Abnormal facies with hypoplastic nasal alae, thin anteverted nostrils and ocular hypertelorism.
- ☐ Micropthalmus, microcornea, iris anomalies and bilateral epicanthic folds.
- ☐ Syndactyly and camptodactyly of the fourth and fifth fingers, with osseous anomalies of the middle phalanx of the fifth finger and toes.
- ☐ Dry, lusterless hair.
- ☐ Generalized enamel hypoplasia (resembling amelogenesis imperfecta), abnormal widening of the mandibular alveolar ridge and, occasionally, cleft lip and cleft palate.[2,3]

The syndrome has been reported to have autosomal dominant inheritance.[4,5]

Previous reports describing the dental management of cases of ODD document gross dental caries secondary to severe enamel hypoplasia.[5-7] The combination of defective odontogenesis, poor oral hygiene and/or neglect results in severely limited treatment options. Early detection, counseling, and an aggressive oral hygiene program can limit the necessity to extract multiple teeth. This case report is representative of an aggressive treatment plan designed to maintain the dentition of a 2.5-year-old child with oculodentodigital dysplasia.

LITERATURE REVIEW

Gellis and Feingold reviewed a case of ODD that was reported in 1975 by Weintraub *et al.*[5,8] The characteristic findings of ODD were expressed in this patient as well as in her brother. The father was reported to show digital abnormalities, and the affected children were said to resemble their father. The mother had an isolated palatal cleft. The authors felt that this pedigree confirmed the autosomal dominant inheritance pattern of the syndrome.

Farman *et al* list several syndromes that need to be considered in the differential diagnosis for ODD.[9] Orodigitofacial dysostosis is very similar, but also exhibited are a facial rash and hypertrophic frenula in association with clefts of the tongue and upper lip.[10] The Hallerman-Streiff syndrome, although similar, does not show digital defects and is associated with a hypoplastic mandible and dwarfism. Reiger's syndrome may be ruled out, since micropthalmia and enamel hypoplasia

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Figure 1. Surgical correction of bilateral 4/5 syndactyly of the patient.

are not characteristic of that anomaly.[3] Gorlin and Pindborg state that Trisomy D is similar, with ocular, digital and jaw defects, but no mention is made of dental anomalies.[3] ODD does not exhibit the Trisomy D chromosomal abnormality.

CASE REPORT

J.M. is a thirty-month-old white male, who presented for comprehensive dental care to the pediatric dental clinic at James Whitcomb Riley Hospital for Children. Physical examination demonstrated repaired bilateral 4/5 syndactyly of the fingers (Figure 1), microcornea, epicanthic folds, a thin nose with hypoplastic alae nasi (Figure 2) and bilateral webbing of toes 2/3 and 3/4. Intraoral examination revealed severe enamel hypoplasia, multiple caries lesions with associated pulpal involvement of the maxillary anterior primary teeth, and hyperplastic maxillary and lingual frenae (Figures 3, 4).

Due to the extent of dental disease present and the patient's poor behavior in the dental environment, it was recommended that the patient's dental care be completed under general anesthesia. Planned procedures and alternative treatments were discussed with the parent. The patient was then referred to Indiana University Medical Genetics Department for evaluation.

The consulting geneticist confirmed the diagnosis of oculodentodigital dysplasia. Supporting the clinical findings was a pedigree indicating autosomal dominant inheritance of ODD (Figure 5). J.M., the proband, has a phenotypically normal brother. Their father is normal and there is no history of ODD or any other genetic disorder in his family. The proband's mother, S.M., is affected and displays the characteristic features of the disorder. S.M.'s mother, the maternal grandmother, displays features of ODD, while her father is normal.

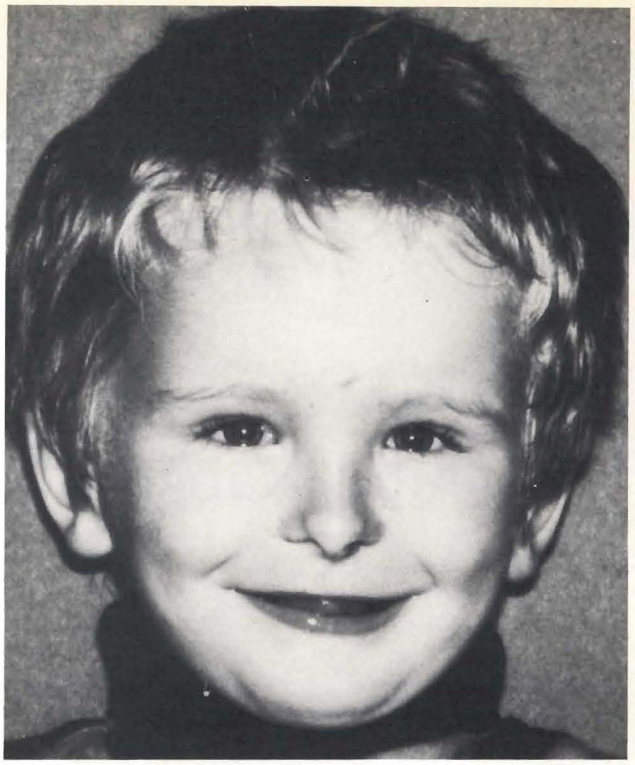

Figure 2. Full face view of patient. Note epicanthal folds, thin nose and hypoplastic alae nasi.

Figure 3. Patient's maxillary arch. Note severe enamel hypoplasia and hyperplastic maxillary frenae.

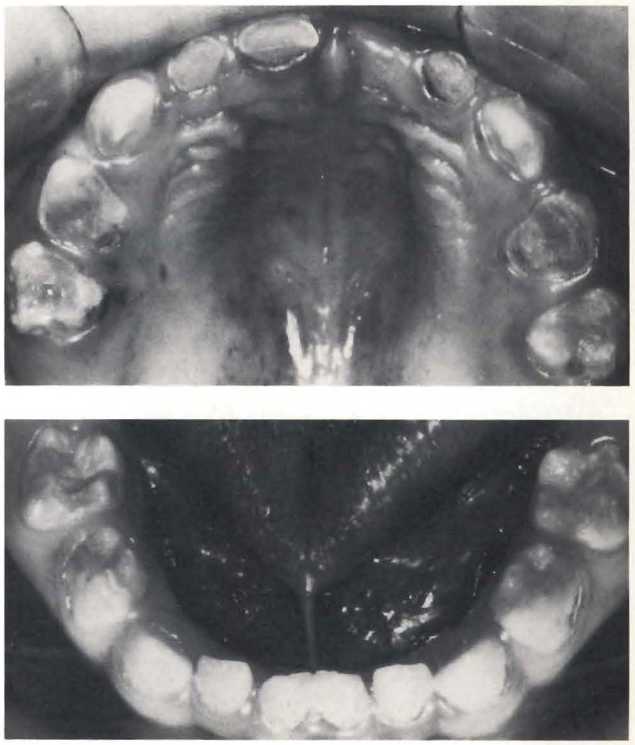

Figure 4. Patient's mandibular arch. Note severe enamel hypoplasia and hyperplastic lingual frenae.

S.M. has five siblings, three normal brothers and two affected sisters. The offspring of one of the sisters with

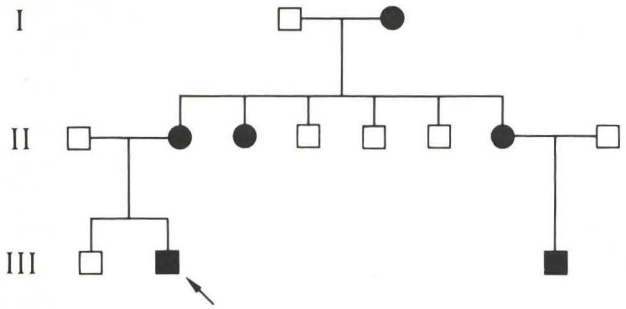

Figure 5. Family pedigree of proband. (arrow)

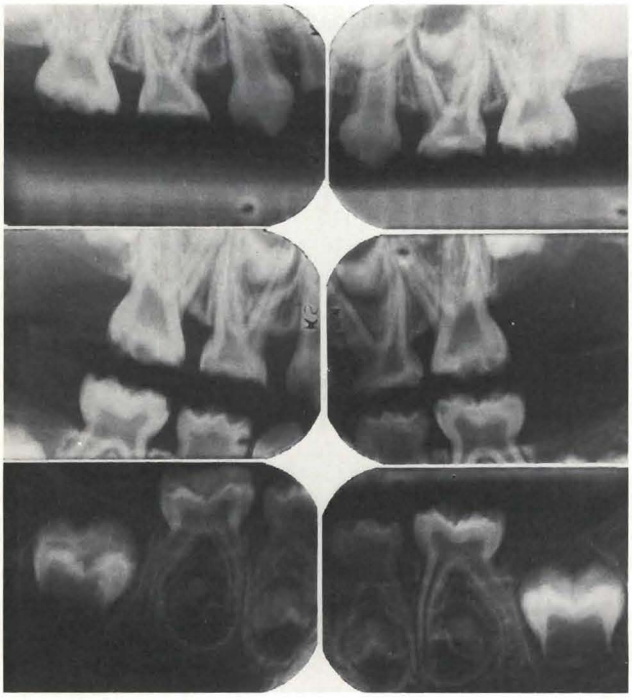

Figure 6. Intraoral radiographs exhibiting generalized enamel hypoplasia.

ODD and a normal male, is a male with ODD. There is no history of any other genetic disorder in the family.

On August 7, 1984, J.M. was admitted to the James Whitcomb Riley Hospital for Children for dental restorations and extractions under general anesthesia. Preoperative history and physical examination by members of the Departments of Pedodontics and Pediatrics were significant only in the history of oculodentodigital dysplasia and the associated physical findings previously mentioned. Preoperative CBS/differential, coagulation profile and urinalysis were within normal limits.

The morning of August 8, 1984 intramuscular meperidine and promethazine were administered as preoperative sedatives. The patient was transported to the operating room and placed in the supine position on the operating table. An intravenous line was established in the dorsum of the patient's right hand and an infusion of 5 percent dextrose in Ringer's lactate was begun.

Figure 7. Immediate postoperative view of patient's maxillary arch.

Anesthesia was induced with intravenous sodium thiopental, atropine and succinylcholine. The patient was atraumatically intubated with a 4.5 mm uncuffed nasotracheal tube entering the right nares, and a surgical plane of anesthesia then was maintained, utilizing halothane, nitrous oxide and oxygen.

Preoperative radiographs, including two bitewing, four posterior periapical and two anterior occlusal films, were obtained (Figure 6). Radiographic and clinical examination revealed generalized enamel hypoplasia of the entire primary dentition. Periapical radiolucencies were radiographically observed and associated with the maxillary incisor teeth D, F and G. Tooth E was missing.

The operative field was prepared and draped in the customary manner for dental restorative procedures, and a moist pharyngeal pack was carefully placed. After removal of the caries, and preparation of the teeth with appropriate hand and rotary instruments, primary teeth A,B,C,H,I,J,K,L,M,R,S, and T were restored with stainless steel crowns. Due to extensive decay and pulpal involvement, teeth D, F and G were extracted. The oral cavity was debrided and restorations polished with a rubber cup and prophylaxis paste. Attention was then directed to the restrictive lingual frenum, which was excised using a standard surgical procedure.[11] After undermining the wound margins, its edges were approximated and closure maintained with three 40 Dexon sutures. The oral cavity was again debrided and suctioned clear. Hemostasis was judged adequate at all operative sites and the pharyngeal pack was removed (Figures 7, 8).

Figure 8. Immediate postoperative view of patient's mandibular arch.

The patient tolerated the two-hour procedure well. Recovery from the anesthesia and extubation were uneventful. The recovery period was unremarkable and the patient spent an uneventful night on the ward. The following morning, thorough postoperative and home care instructions were given to the parents, which included:

- ☐ No bottle feeding.
- ☐ Soft food, liquid diet for forty-eight hours.
- ☐ Acetaminophen elixir with codeine, one teaspoon q6h as needed for pain.
- ☐ Penicillin elixir, 250/5cc, one teaspoon q.i.d. for seven days.

The patient was then discharged to the care of his parents.

The patient returned in two weeks for postoperative observation. The extraction sites and lingual frenectomy were well healed. All restorations appeared stable and intact, although multiple areas of plaque accumulation were observed at the cervical margins of many restorations. The importance of home oral care was stressed to the patient's mother. Oral hygiene instructions were given and the patient was scheduled to return in three months for a recall examination, prophylaxis and fluoride therapy.

SUMMARY

Oculodentodigital dysplasia is a rare autosomal dominant syndrome characterized by typical facies and certain anomalies of the eyes, dentition and digits. This report describes the case of a 2.5-year-old white male with oculodentodigital dysplasia and his comprehensive dental treatment. Aggressive treatment to maintain the integrity of the patient's primary dentition was provided. The characteristic physical and genetic findings of oculodentodigital dysplasia were also described.

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Ankylosis in monozygotic twins

Development

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Ankylosis is defined as the fusion of tooth cementum to alveolar bone, which occurs where there has been a break in the continuity of the periodontal ligament.[1-20] Histologically, a portion of the ligament is replaced with calcified tissue, thus attaching the tooth directly to bone.[2] Thornton and Zimmerman state that this histologic finding is not affected by age, sex, type of tooth, or location. They do, however, report that the presence of a succedaneous tooth and the duration of ankylosis seem to modify the histology, with the point of fixation moving from the lateral root surface toward the apical foramen.[6]

Clinically, the ankylosed tooth appears to be depressed below the level of the occlusal plane and has, therefore, often been called a "submerged tooth." This term is, in fact, a misnomer, since ankylosis is not a process of sinking, but one of noneruption of uninvolved teeth, which gives the impression and appearance that the ankylosed tooth is submerging. Biederman feels that this defect is best considered in terms of growth and development and comments that it can occur along a tooth's path of eruption, before or after its emergence into the mouth.[5]

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While the range of prevalence for ankylosis has been reported as 1.3-38.5 percent, Brearley and McKibben's exhaustive study found the condition in 6.9 percent of their study population.[2-3] Messer and Cline attributed this range of findings to different diagnostic criteria and ethnic factors.[3] These factors might also account for the lack of agreement regarding whether the mandibular first or second primary molar has the highest incidence of involvement. Recent literature indicates that it is the mandibular first primary molar, not the second, which is most frequently ankylosed.[2,7,10,11,16] Brearley and McKibben reported the following prevalence results from their investigation: the mandibular first primary molar, 4.3 percent; the mandibular second primary molar, 1.2 percent; the maxillary first primary molar, 0.5 percent; and the maxillary second primary molar, 0.2 percent. They further found that

- ☐ There is no predilection for the right or left side.
- ☐ Multiple instances of ankylosis are almost as frequent as single tooth involvement.
- ☐ Distribution is symmetrical.
- ☐ When multiple teeth are ankylosed, 90 percent involve the antimere and 10 percent involve the adjacent teeth.

Lastly, Brearley and McKibben report that when multiple ankylosed teeth are encountered, they demonstrate the same degree of infraclusion.[2] Messer and Cline expanded on these earlier studies and added that

- ☐ Most maxillary first and second primary molars were in moderate or severe infraclusion when diagnosed.
- ☐ The mandibular first primary molars were only slightly affected and rarely severe.
- ☐ Mandibular second primary molars progressed toward a more severe degree of infraclusion.[3]

The etiology of ankylosis is unknown, and although a number of theories, relative to trauma, local infection, excessive masticatory pressure, disturbed local metabolism, and a congenital defect in the periodontal ligament, have been suggested, none of these has proved to be satisfactory.[1-20] Braham states that, although the etiology remains obscure, some weight must be given to genetic involvement.[13]

Via was the first to report that ankylosis demonstrated a familial tendency and was probably an inherited trait.[1] Since that time, several authors have lent support to this hypothesis.[3,7,11-14,16-19] Krakowiak commented that a number of cases of ankylosis in members of the same family indicated a hereditary tendency. His own research showed that siblings show ankylosis. He further found that black children had a lower prevalence of

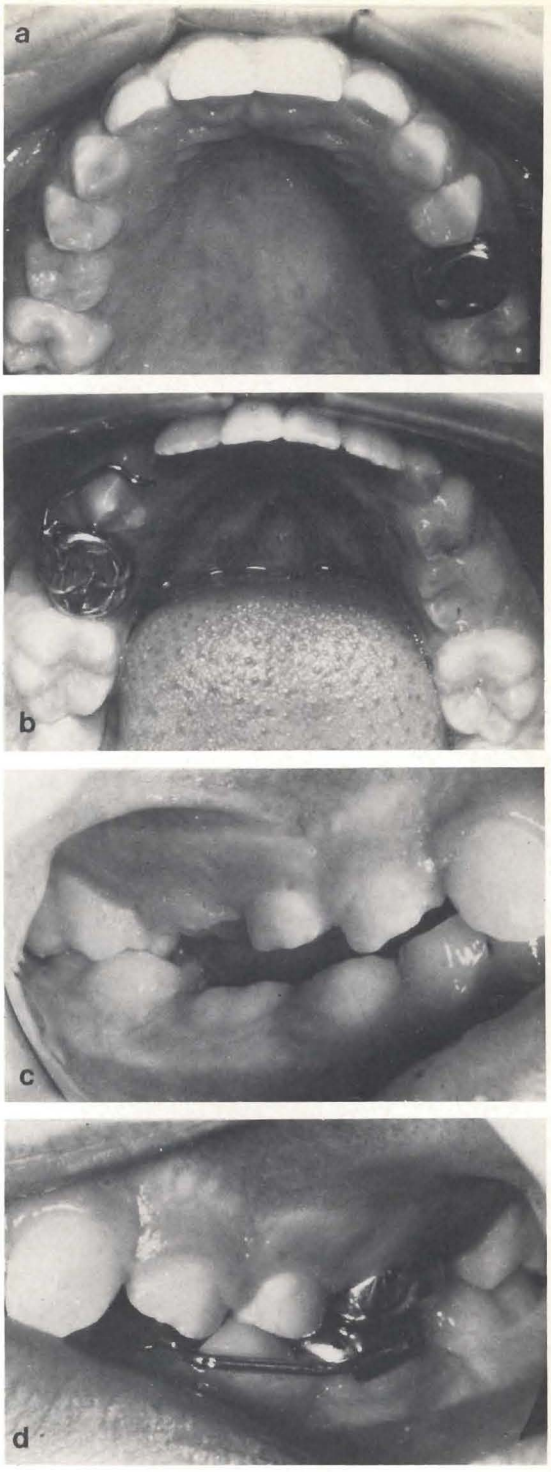

Figure 1. Twin A: Mixed dentition showing a stainless steel crown and a space maintainer.

ankylosis than did white children, a finding also reported by Mueller.[7,16] McDonald and Avery agree that a familial tendency has been noted and add that it is probably not sex-linked.[11,12,18] Stewart and Hansen's case report makes the strongest statement for some genetic input into the etiology of ankylosis. They felt that finding concordant patterns of ankylosis in monozygotic twins lent strong support to the theory that there was a significant genetic component to ankylosis. They

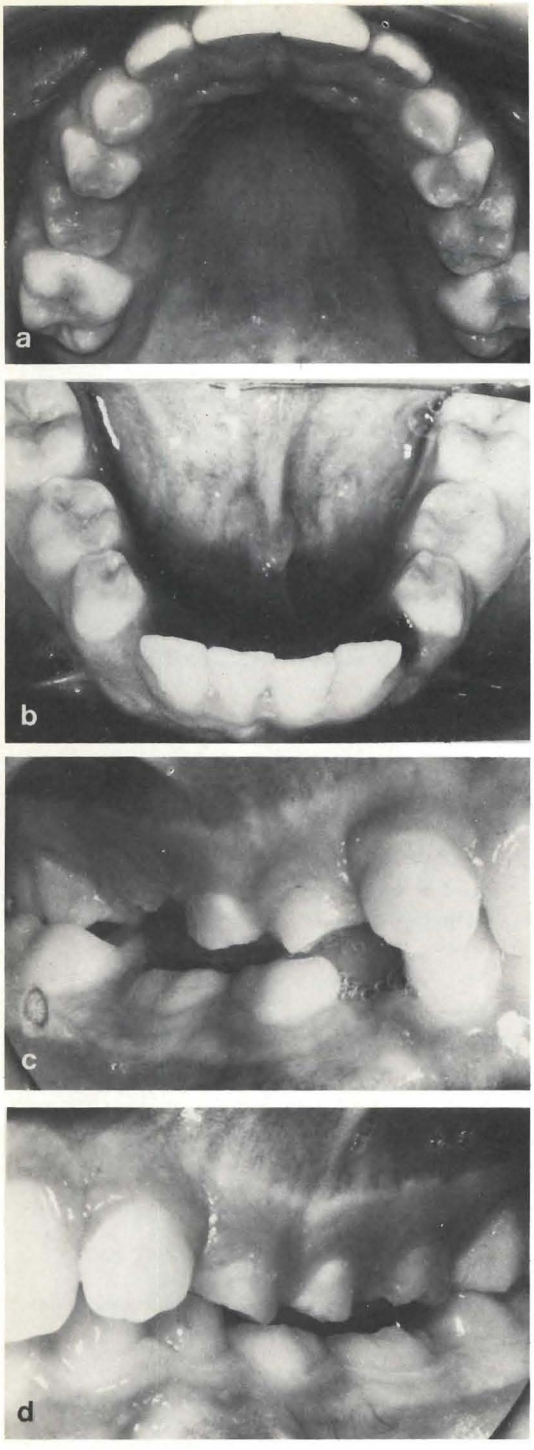

Figure 2. Twin B: Mixed dentition and no restorations.

further commented that they felt a genetic etiology would support a familial pattern reported by Via and also the local metabolism theory that was previously expounded.

The following case report of ankylosis in identical male twins graphically demonstrates many of those aspects of ankylosis discussed above, as well as providing further evidence that there is a strong genetic component in the etiology of this process.

CASE REPORT

Ten-year-old white male twins presented to the University of Mississippi School of Dentistry in January, 1985, for routine dental treatment. The twins were monozygotic; birth was reported to be atraumatic; there are no siblings. Medical history was unremarkable.

Initial oral examination revealed poor oral hygiene and mild marginal gingivitis. All other soft tissues were within normal limits. Hard tissue examination showed each child in the mixed dentition stage. Mild dental caries was noted. One child (Twin A) had previously received a stainless steel crown restoration and crown-unilateral arm space maintainer (Figure 1). The other child (Twin B) had no restoration (Figure 2). There were no areas of enamel hypoplasia or hypocalcification in either child. Radiographic survey demonstrated a full complement of permanent teeth developing in both twins, with the possible exception of a missing maxillary third molar in each (Figures 3, 4).

Orthodontic evaluation revealed each twin to have a bilateral Class I molar relationship, mandibular midline shift to the left of less than 1 mm, overbite of 75 percent, and overjet of 3 mm. Mild to moderate crowding was evident in both arches. Twin B had a posterior crossbite involving the right first permanent molars.

Ankylosed teeth were noted as shown in Figures 1-4. In the maxillary right quadrant in both twins, the second primary molars were submerged 2-3 mm; the first primary molars were in infraclusion, 1-2 mm; while the second primary molars were submerged 2-3 mm. In the mandibular left quadrant in each twin, the second primary molar was submerged 2-3 mm. The mandibular first primary molar was in infraclusion, approximately 2 mm in Twin B; in Twin A, this tooth had exfoliated and the first premolar was erupting. In the maxillary left quadrant, neither twin showed any evidence of ankylosis.

DISCUSSION

Twins A and B demonstrate several of the findings which were previously reported on ankylosis. Brearley and McKibben reported that multiple instances of ankylosis were almost as likely to occur as single instances.[2] Here Twin A had four teeth ankylosed and Twin B had five teeth involved. Brearley and McKibben concluded that there was no predilection for ankylosis on the right or left side of the mouth and the distribution was symmetrical.[2] Both twins described here demonstrated ankylosis on the right and left sides and distribu-

Figure 3. Twin A: Panoramic radiograph.

tion was, indeed, symmetrical in the mandibular arch of each. Mandibular arches also showed involvement of antimere and adjacent teeth, another finding which was in agreement with Brearley and McKibben.[2] The severity of ankylosis seen in the maxillary and mandibular arches of Twins A and B was in accord with the pattern reported by Messer and Cline.[3] In the maxillary arch of both twins, the ankylosed second primary molars were in moderate to severe infraclusion. In the mandibular arches, the first primary molars were only slightly submerged, while the second primary molars were more severely involved.

The most notable feature of this case report is the nearly identical pattern in the distribution and severity of ankylosis. These findings lend strong support to the previously proposed hypothesis that heredity plays a significant role in the etiology of ankylosis. This, in turn, is compatible with the familial pattern for ankylosis, which has been reported by many authors.

Since these twins do not exhibit hypodontia, as was seen in Stewart and Hansen's twins, it might further be postulated that the genes controlling ankylosis and tooth formation are not closely related.[17] This fact weakens Stewart and Hansen's speculation regarding the role of enamel epithelium in the development of these anomalies and the possibility of a single genetic defect giving rise to both.[17]

Unfortunately, the mother and father could not give an accurate dental history of ankylosis in the family, information which would be valuable in establishing a hereditary pattern. Further study and reporting of ankylosis in twins should be enlightening and strongly encouraged.

CONCLUSION

Monozygotic twins exhibiting nearly identical patterns of ankylosed teeth and degree of involvement have been presented. The findings in these twins reinforce the theory that there is a strong genetic component in the process of ankylosis.

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Figure 4. Twin B: Panoramic radiograph.

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CEMENTICLES

Abnormal, calcified bodies are occasionally found in the periodontal ligament at some distance from the root surface. These structures are called *cementicles.* It is not completely clear why they form. Generally cementicles seem to form first on cellular debris, such as the epithelial root sheath remnants (cell rests of Malassez). In their appearance, cementicles resemble most the regularly growing pulp stones in the dental pulp.

The cementicles may be completely free inside the periodontal ligament. In that case they are called *free* cementicles. Continued cementum deposition on the root surface, as well as on the cementicle's surface, combined with a possible motion of the tooth toward the cementicle, may cause the cementicle to become *attached* to and eventually *embedded* in the cementum layer on the root.

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Nutrition

Dietary antioxidants and cancer

John A. Milner, PhD

Cancer is a growing concern to all segments of our society and ranks as the second leading cause of death for Americans. Differences in the susceptibility to cancer have been attributed to environmental factors in part, including variations in dietary customs and habits. These customs and habits may increase or decrease the risk of cancer depending on the relative intakes of nutrient and nonnutritive components of the diet.

Cancer is defined as a population of cells that has uncontrolled growth and has spread without normal restraints. The cancer process is thought to involve at least two phases: initiation and promotion. Initiation is the rapid, irreversible consequence of damage to cellular macromolecules, such as DNA. Such modification affects all aspects of the cell. Promotion is the accelerated division of the initiated cell ultimately leading to uncontrolled growth. Diet may modify the process of carcinogenesis by modification of either the initiation or the promotion phases.

ANTIOXIDANTS AS CANCER INHIBITORS

Interest in antioxidants as modifiers of the carcinogenic process has stemmed from the "Free Radical Theory of Carcinogenesis." This theory suggests that genetic modification caused by oxy and peroxy radicals formed by oxidation of carcinogens, or caused by reduced oxy-

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gen species such as hydroxyl and superoxide radicals, hydrogen or organic peroxides formed as secondary products of metabolism, leads to transformed cells.[1] A common property of promoters may be their ability to produce oxygen radicals.

Antioxidants as modifiers of these processes have been items of intense scientific debate. The demonstration that under specific conditions, vitamins A, E, C, certain synthetic antioxidants, as well as selenium, have anticarcinogenic activity in experimental animals has supported this hypothesis. Although much is known about these agents, this brief review will attempt to provide some of the recent concepts and research controversies in this exciting area.

VITAMIN A

Vitamin A is a generic term referring to two families of dietary factors, one comprising the various types of preformed vitamin A (retinyl esters, retinol and retinyl) and the other including various types of provitamin A (carotenoids). In humans, carotenoids can be absorbed intact and vary widely in their vitamin A equivalency. Various studies have reported an inverse relationship between apparent vitamin A intake and the incidence of a variety of cancers.[2] These studies have for the most part only monitored β carotene intakes.

Various investigators have suggested that low serum retinol levels are associated with increased risk of cancer.[2-5] Studies in various parts of the world suggest blood retinol or β-carotene levels are lower in patients with cancers of the oral cavity, nasopharyngeal cavity, lung and gastrointestinal tract.[2] However, the relationship between dietary intakes and its level in serum, which normally is homeostatically controlled, is not clear, especially in populations not generally considered deficient in this nutrient.

Nevertheless, there is evidence in animal models that vitamin A deficiency increases the susceptibility to chemically induced tumors and that excess vitamin A tends to inhibit this induction.[6] Relative to the free radical theory of cancer, vitamin A has been shown to inhibit microsomal lipid perioxidation.[7] Supplemental retinyl acetate also inhibits experimentally induced oral cancer in hamsters even after precancerous lesions were present and carcinomas had begun.[8] Vitamin A has also been shown to inhibit breast cancer in models where the carcinogen used did not require activation.[6] These data suggest that vitamin A may also inhibit the promotion or proliferation of transformed cells in addition to a direct effect on initiation. Due to the potential toxicity of vitamin A, its usefulness as an anticarcinogenic agent in humans is questionable.

Various carotenoids have also been found to protect mice against UV-induced skin tumors.[9] While the mechanism of action of the carotenoids does not appear to depend on their provitamin A activity, it may relate to some other intrinsic factor, possibly free radical scavenging.[10] Carotenoids are less toxic and may, therefore, offer promise as an anticarcinogenic agent in humans.[11]

VITAMIN C

Epidemiological studies, based on the consumption of foods known to contain high concentration of this vitamin, suggest that vitamin C may lower the risk of cancer, particularly in the esophagus and stomach but not colon cancer.[10,12,13] Such observations are consistent with data from experimental animals showing that vitamin C is effective in blocking the reaction of secondary and higher amines with nitrite thus decreasing the formation of nitrosamines.[14] The treatment of pregnant hamsters with ascorbate together with nitrite and ethylurea (precursors of ethylnitrosourea) completely inhibited the induction of tumors in the offspring.[15] Other experiments reveal high dietary sodium ascorbate reduces the incidence of lung tumors in mice treated with various amines along with nitrite.[16] The effect of vitamin C on carcinogenesis induced with other chemicals has not been conclusive.

Low concentrations of ascorbic acid also suppressed the growth of human leukemia cells from patients with acute nonlymphocytic leukemia under conditions in which the growth of normal myeloid colonies were not suppressed.[17] Thus, some neoplastic cells may also respond to supplemental vitamin C. The importance of vitamin C as an inhibitor of overall carcinogenesis remains an area of active interest.

VITAMIN E

Although α-tocopherol is the active form often designated as vitamin E, there are seven other naturally occurring tocopherols. Little epidemiological data are available on the association of vitamin E intakes with cancer risk. However, like vitamin C, this vitamin competes for nitrite and thereby can reduce the formation of nitroso compounds.[18] Most commercial preparations of α-tocopherol are present as the acetate or hemisuccinate esters and as such are inactive as scavengers of nitrosating species.

Vitamin E has been reported to provide some protec-

tion against carcinogenesis in animals receiving methylcholanthrene, by 7,12 dimethylbenz(a)anthracene (DMBA) and by dimethylhydrazine and to inhibit the chromosomal damage caused by benzopyrene to cells in culture.[19-22] Increased urinary excretion of malonaldehyde, an *in vivo* carcinogenic decomposition product of fatty acid peroxides, occurs in rats deficient in this vitamin.[23] However, vitamin E appears to be less effective against chemically induced carcinogenesis than the major commercial synthetic food antioxidants.[24]

SYNTHETIC ANTIOXIDANTS

Protection against chemically induced cancer has been most clearly demonstrated in animals in the case of food antioxidants butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT). The commercial lipid antioxidant, ethyoxyquin, also has anticarcinogenic properties.[24,25] The anticarcinogenicity of these agents does not appear to relate to a common structural characteristic. Furthermore, certain food antioxidants, such as BHA and BHT, are ineffective as substitutes to prevent and treat vitamin E deficiency.[26] Nevertheless, numerous experiments have shown that BHA has anticarcinogenic properties against a wide array of chemical carcinogens which cause tumors in several different target organs.[24]

The minimum effective dietary concentration of BHT is influenced by the dietary composition, by the quantity of carcinogen given and by the species examined. King and McCay found BHT to be superior to BHA as an inhibitor of DMBA mammary tumorigenesis but ineffective to the direct acting carcinogen, nitrosourea.[25] The effectiveness of BHT does appear to relate to the degree of unsaturation of dietary fat and therefore may relate to its antioxidant properties.[27] However, both BHA and BHT appear to protect against chemically induced tumors also by accelerating the catabolism and excretion of carcinogens via enzyme modification.[24] While the quantities needed to lead to these inhibitions are considerably higher than typical daily intakes of humans, they nonetheless are dramatic.

SELENIUM

Considerable evidence, both epidemiological and experimental, supports the hypothesis that increased dietary intake of selenium decreases the susceptibility to cancer.[28,29] Selenium has been shown to inhibit a wide array of carcinogens which cause cancer at a variety of locations. Selenium is unique, in that it has been shown to inhibit the growth of chemically induced, virally induced and transplantable tumors in experimental animals.[30,31] Relatively high amounts of selenium are required in experimental animals to bring about a reduced susceptibility. A minimum requirement for selenium in most mammals is about 0.05 μ/g diet, which is about 40 times lower than the quantity typically given experimentally to inhibit carcinogenesis. The relative toxicity of selenium is an area of continual concern. The effectiveness of selenium does not relate to its function as a component of glutathione peroxidase.[30] The available data suggest that selenium may modify the metabolsim of carcinogens and also decrease the proliferation of neoplastic cells.

SUMMARY

Scientifically valid data on the relationship of antioxidants to cancer come from three major sources: human epidemiological studies, experimental studies with animals and *in vitro* tests for genetic toxicity. Controversies are inevitable when data are either not clear-cut or incomplete. This is clearly the case for the effects of vitamins A, C, E, synthetic antioxidants and selenium on the risk of cancer. Interpretations therefore depend on the criteria selected for evaluation and are influenced by individual or collective judgment. Considerable research indicates the cancer inhibitory effects of vitamin A, vitamin C, synthetic antioxidants and selenium may be due in part to their ability to alter the enzymes involved in the metabolism of carcinogens or to inhibit cancer promotion, rather than their antioxidant properties per se. Vitamin C and E are generally less active inhibitors of overall carcinogenesis, yet their action may relate to the sequestering of genotoxic free radicals.

The overwhelming evidence suggests that what we eat can influence the probability of certain types of cancer. It is not at present possible to specify a diet that protects all people. Characterizing and optimizing defense systems may represent an important strategy for minimizing cancer risk.[32] It must be emphasized that any nutrient taken in excess can be toxic. Therefore, the indiscriminate use of supplements may lead to as many complications as what they are aimed at preventing. Therefore, even with the vast accumulation of new knowledge regarding these dietary constituents, nutrition experts continue to emphasize that it is best to eat a varied and balanced diet and maintain weight within a reasonable range.

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ACTIVITY LIMITATIONS AMONG CHILDREN UNDER 17 YEARS OF AGE

Many of the conditions responsible for the overall rise in reported limitations between 1969 and 1981 are related to what has been termed the "new morbidity." Although a somewhat general term, new morbidity reflects the changing nature of pediatric practice as it shifts away from traditional medical illnesses towards those with a greater psychosocial component. As Haggerty, Roghmann, and Pless have stated: "The current major health problems of children, as seen by the community, are those that would have barely been mentioned a generation ago. Learning difficulties and school problems, behavioral disturbances, allergies, speech difficulties, visual problems, and the problems of adolescents in coping and adjusting are today the most common concerns about children." Some of these problems are actually old problems that always existed but were ignored as more pressing needs took priority. Increased concern over such problems may be partly attributable to a shrinking child population that occurred simultaneously with an expansion in the number of practicing pediatricians during the early 1970s. With more pediatricians and fewer children, more time and energy could be focused on less tractable and previously undertreated problems.

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Health implications of obesity

Rita A. Warren

Current knowledge of human obesity has progressed beyond the simple generalization of the past. It is almost certain that obesity has multiple causes and that there are different types of obesity.

To assess the health implications of obesity, new knowledge and new epidemiologic observations have introduced a variety of complications that must be addressed. The interpretations of different studies have been complicated by smoking behavior, the coexistence of other diseases and variations in methods of data collection. Because population studies have not been representative of the U.S., there have been uncertainties as to how far the results can be projected.

There is evidence that an increasing number of children and adolescents are overweight. Even though not all overweight children will necessarily become overweight adults, the increasing prevalence of obesity in childhood is likely to be reflected in increasing obesity in adult years. The high prevalence of obesity in our adult population and the likelihood that the nation of the future will be even more obese demand a reassessment of the health implications of this condition.

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Rita A. Warren is editor of Contemporary Nutrition. The information in this article is a summary of the Panel's Conclusion of a National Institutes of Health Consensus Development Conference Statement on Health Implications of Obesity.

WHAT IS OBESITY?

Adipose tissue is a normal constituent of the human body that serves the important function of storing energy as fat for mobilization in response to metabolic demands. Obesity is an excess of body fat frequently resulting in a significant impairment of health. The excess fat accumulation is associated with increased fat cell size; in individuals with extreme obesity, fat cell numbers are also increased. Although the etiologic mechanisms underlying obesity require further clarification, the net effect of such mechanisms leads to an imbalance between energy intake and expenditure. Both genetic and environmental factors are likely to be involved in the pathogenesis of obesity and include excess caloric intake, decreased physical activity and metabolic and endocrine abnormalities. Hence, a number of subtypes of obesity exist.

The precise determination of the amount of body fat requires technically sophisticated methods that are available only in research laboratories. For public health studies and clinical practice, simple and convenient anthropometric measurements based on height, weight and skinfold thickness are recommended. For adults of 20 years and older, two methods are now in wide use:

- ☐ Estimation of relative weight (RW) in the 1959 or 1983 Metropolitan Life Insurance Company tables and
- ☐ Calculation of body mass index (BMI).

Separate criteria must be used for evaluating fatness in children and adolescents.

Adipose tissue depots do not constitute a uniform organ; fat cells around the waist and flank and in the abdomen are more active metabolically than those in the thigh and buttocks. The location of body fat has emerged as an important predictor of the health hazards of obesity. Sites of body fat predominance are easily measured by the ratio of waist to hip circumferences. High ratios are associated with higher risks for death and illness.

The panelists agree that an increase in body weight of 20 percent or more above desirable body weight constitutes an established health hazard. Significant health risks at lower levels of obesity can present hazards, especially in the presence of diabetes, hypertension, heart disease or their associated risk factors.

WHAT IS THE EVIDENCE THAT OBESITY HAS ADVERSE EFFECTS ON HEALTH?

Clinical observations have long suggested a connection of obesity (particularly in its extreme forms) with a variety of illnesses. Obesity creates an enormous psychological burden. In fact, in terms of suffering, this burden may be the greatest adverse effect of obesity. At the present time, the strongest evidence that obesity has an adverse effect on physical health comes from population-based prevalence (cross-sectional) and cohort (follow-up) studies. These data are complemented by weight-reduction trials.

The most comprehensive data on prevalence of cardiovascular disease (CVD) risk factors and obesity are from the National Health and Nutrition Examination Surveys (NHANES I [1971-1974] and NHANES II [1976-1980] based on representative samples of residents of the United States).

Data from NHANES II were analyzed by comparing several parameters for the subjects at or above, or below, the 85th percentile of the noninstitutionalized, nonpregnant U.S. residents, ages 20 to 29, from 1976 to 1980. At or above this cutoff point, males have a BMI $\geq$27.8 and females have a BMI $\geq$27.3. This analysis showed a strong association between the prevalence of obesity and CVD risk factors. Based on these criteria, the prevalence of hypertension (blood pressure greater than 160/95) is 2.9 times higher for the overweight than for the nonoverweight. The prevalence is 5.6 times higher for the young (20 through 44 years old) overweight than for the nonoverweight subjects in this age group. The prevalence is twice as high for the obese older (45 through 74 years old) overweight than for the nonoverweight subjects in this age group. The prevalence of hypercholesterolemia (blood cholesterol over 250 mg/dl) in the young overweight group is 2.1 times that of the nonoverweight group; overweight and nonoverweight subjects shown similar prevalences for hypercholesterolemia after age 45.

Levels of blood pressure and serum cholesterol vary with levels of obesity in a continuous manner. This relationship holds for the so-called normal, as well as the elevated, range in observational studies. Intervention studies confirm that levels of blood pressure and serum cholesterol can be reduced by weight reduction.

The prevalence of reported diabetes is 2.9 times higher in overweight than nonoverweight persons in the NHANES data. Type II diabetes (maturity onset or noninsulin-dependent mellitus-NIDDM) appears to be an inherited disease; however, studies clearly show that weight reduction can reverse the abnormal biochemical characteristics of NIDDM.

CORONARY ARTERY HEART DISEASE (CAHD)

The relationship of obesity to the incidence of CAHD has been studied in a large number of cohort studies. In contrast to the consistent relationship of obesity of CAHD risk factors found in the overwhelming majority of prevalence studies, widely divergent results have been reported for the relationship of obesity to the incidence of CAHD. Thus, the eight cohort studies of U.S. Pooling Project found discrepant results, including no association, a U-shaped relationship, and a positive relationship of obesity to CAHD. However, when data from these same studies were combined, there was a positive relationship of obesity to the risk of CAHD. Possible explanations for the discrepant findings include differences in health status of industrial workers in contrast with health status of the total population, varying duration of follow-up among the studies and inadequate sample sizes.

Studies in which obesity predicted CAHD usually found that obesity was not a risk factor independent of the standard risk factors. However, the Framingham Study, a large, general population-based study that is strengthened by having long duration follow-up data, recently disclosed an increasing risk of CAHD with increasing levels of obesity, independent of the other standard risk factors.

Other recent studies indicate that the distribution of

fat deposits may be a better predictor of CAHD than is the degree of obesity. Excess abdominal fat is more often related to disease than are fat deposits in the thigh or gluteal areas.

CANCER

There are numerous epidemiological studies of obesity and site-specific malignancies, one of the largest of which is the American Cancer Society (ACS) Study involving more than one million men and women. Through the last follow-up year (1972), 93 percent of the subjects were traced (alive or dead). Obese males, regardless of smoking habits, had a higher mortality from cancer of the colon, rectum and prostate. Obese females had a higher mortality from cancer of the gallbladder, biliary passages, breast (post-menopausal), uterus (including both cervix and endometrium), and ovaries. In the case of endometrial cancer, women with marked obesity showed the highest relative risk for the obese versus the nonobese.

WHAT IS THE EVIDENCE THAT OBESITY AFFECTS LONGEVITY?

Obesity has an adverse effect on longevity. Convincing evidence of this has been evaluated in four very large insurance studies (1903 to 1979), the Framingham 30-Year Follow-Up Study, the American Cancer Society Study and other small cohort studies. Some additional cohort studies do not show this adverse effect, but these studies present problems in interpretation due to small size, follow-up of ten years or less, occupational bias or a population otherwise not representative of the U.S. population.

The increase in mortality versus relative weight is steeper in men and women under age 50 than in older persons and the increase with duration is also steeper. These findings suggest that particular attention should be paid to efforts to reduce weight in younger patients.

Recent studies suggest that the distribution of fat deposits may be a better predictor of mortality than BMI or RW. If confirmed, it may be important in the future to measure fat distribution in addition to using height-weight tables.

TABLES OF DESIRABLE WEIGHTS BY HEIGHT

Tables based on weights associated with the lowest mortality rate among insured populations of adults are widely available. At least two versions are in current use; the 1959 Metropolitan Life Insurance Company table and the 1983 revision.

Confusion exists as a result of the slight increases in desirable weights seen in the 1983, as opposed to the 1959, tables. In the 1983 tables, desirable weights for men and women in the shortest stature groups are 12 and 14 pounds higher, respectively, than they were in 1959. It is recognized that such increased body weight may contribute to high blood pressure, hypercholesterolemia and glucose intolerance or similar risk factors, apart from the impact of weight on mortality. Neither the 1959 nor the 1983 height-weight tables reflect current weight and mortality relationship for the American population, since the deaths reflect mortality of policyholders 11 years prior to the publication of the tables.

BODY MASS INDEX (BMI)

$$\text{BMI} = \frac{\text{Body wt. in kg.}}{(\text{Ht. in m})^2}$$

The body mass index is another simple measurement highly correlated with other estimates of fatness. It minimizes the effect of height and is useful for descriptive or evaluative purposes. It has the advantage of permitting comparison of populations. The major limitation of the BMI is that it is difficult to interpret to patients.

The consensus panel recommends that physicians adopt this measure as an additional factor in evaluating patients and that nomograms be used to facilitate calculations of BMI.

FOR WHAT MEDICAL CONDITIONS CAN WEIGHT REDUCTION BE RECOMMENDED?

Weight reduction may be a critical factor for patients with cardiopulmonary symptoms in which extreme obesity, arbitrarily defined as weight twice the desirable weight or 45 kg (100 pounds) over desirable weight, is a contributing factor.

Weight reduction should be recommended to persons with excess body weight of 20 percent or more above desirable weights in the Metropolitan Life Insurance Company tables (using the midpoint of the range for a medium-build person). In the 1983 tables, 20 percent over desirable weight is a higher weight than would be obtained by the use of the 1959 tables. The maximum increase is found in those of short stature. Use of the

lower weights as goals would be advisable in the presence of some complications. The BMI values for men and women identified with the lower cutoff point for overweight are 27.8 and 27.3, respectively (as determined by the National Center for Health Statistics).

Weight reduction is also desirable, even in patients with lesser degrees of obesity, in many other circumstances, such as noninsulin-dependent diabetes mellitus, hypertension and hypertriglyceridemia or hypercholesterolemia.

Weight reduction is likely to be helpful, although the benefits may not be as clear in other circumstances, including coronary heart disease and gout.

In any circumstances in which excessive weight imposes functional burdens, such as chronic obstructive pulmonary disease or osteoarthritis of the spine, legs or knees, weight reduction may improve functioning of the affected system, organ or region. In addition to diagnosis and treatment by physicians, the assistance of other health professionals is critical for treatment in any weight-reduction program. When exercise is prescribed as an adjunct to other methods of weight reduction, assessment by a physician of the cardiopulmonary risk of exercise is especially important.

WHAT SHOULD BE THE DIRECTIONS OF FUTURE RESEARCH IN THIS AREA?

Several areas of investigation are stressed by the Panel. In infancy and childhood, we must search for biological (genetic, metabolic or anthropometric) markers as predictors of adult obesity. We need to define the mechanism by which body fat distribution is associated with adverse effects of obesity. In the complex area of energy balance, we need to understand the effects of the central and autonomic nervous systems and the endocrine system, adipose tissue cellularity and metabolism, the role of various components of thermogenesis in the overall control of energy balance, control of food intake (e.g., endogenous opiods) and satiety factors (e.g., gut hormones). Relative risk tables that incorporate both fat and distribution and height-weight data should be developed.

CONCLUSIONS

The evidence is now overwhelming that obesity, defined as excessive storage of energy in the form of fat, has adverse effects on health and longevity. Obesity is clearly associated with hypertension, hypercholesterolemia, NIDDM, and excess of certain cancers and other medical problems. Height and weight tables based on mortality data or the body mass index are helpful measures to determine the presence of obesity and the need for treatment. Thirty-four million adult Americans have a body mass index greater than 27.8 (men) or 27.3 (women). At this level of obesity, which is very close to a weight increase of 20 percent above desirable, treatment is strongly advised. When diabetes, hypertension or a family history for these diseases is present, treatment will lead to benefits even when lesser degrees of obesity are present.

Obesity research efforts should be directed toward elucidation of biologic markers, factors regulating the regional distribution of fat, studies of energy regulation and studies utilizing the techniques of anthropology, psychiatry and the social sciences.

SMOKELESS TOBACCO USE IN A POPULATION OF HIGH SCHOOL STUDENTS

Users were queried about concurrent use of cigarettes and beverage alcohol. There was only a modest level (28.2 per cent) of combined tobacco activity, but 70.7 percent stated they also used alcohol periodically. Level of cigarette and alcohol use was not assessed.

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