

ASDC

AMERICAN SOCIETY OF DENTISTRY FOR CHILDREN

JANUARY-FEBRUARY 1990

JOURNAL OF DENTISTRY FOR CHILDREN

George W. Teuscher

READER • WRITER • DENTIST
SCHOLAR • TEACHER
ADMINISTRATOR • EDITOR

... AND GOING STRONG

ONE MAN TRAVELING OPPOSITE THE FLOW
IS MORE CLEARLY NOTICED
THAN ALL WHO TRAVEL TOGETHER

—Noah benShea

A SPECIAL ISSUE

JOURNAL OF DENTISTRY FOR CHILDREN

Volume 57 Number 1 January-February, 1990

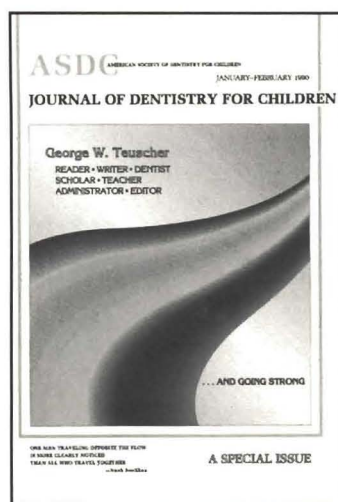
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All copy and manuscripts for the journal should be sent directly to the Editorial Office, 730 Blaney Drive, Dyer, Indiana 46311, (219) 865-1184.

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A long professional career has provided George W. Teuscher with opportunities to contribute to a spectrum of disciplines affecting the health of children. Cover concept by John B. Goetz; art by Sharlene Nowak-Stallmach.

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A SPECIAL ISSUE HONORING GEORGE W. TEUSCHER

On the occasion of his completion of twenty one years as editor of this journal, this special commemorative issue is dedicated to the man whose gentle wisdom has been a guiding light to students, young and old, of dentistry for children. The invited contributions appearing in this issue are intended to serve as a review and celebration of the progress made in selected areas of children's dentistry during the first two decades of Dr. Teuscher's tenure as editor. This festschrift is offered as a token of our gratitude, esteem and affection.

Editors of this issue

Donald W. Kohn and Jimmy R. Pinkham

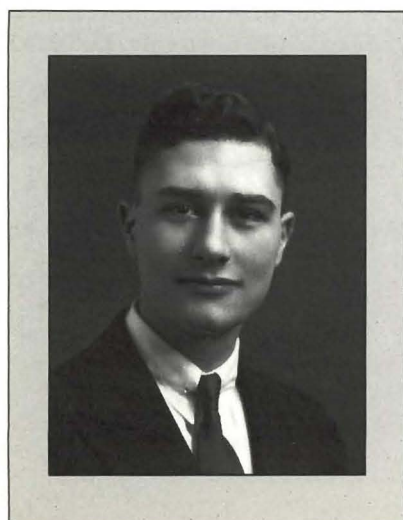
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Donald W. Kohn, DDS

Presented here is an overview of issues and topics covered in the Journal during the last twenty-one years by Dr. George W. Teuscher, who has served as editor since January 1968. One hundred twenty-six issues of JDC have covered these categories: preventive behavior; child behavior; professional and government relations; the dental marketplace; dental education; organized dentistry; care for the indigent and disabled; and ethics and social responsibility.

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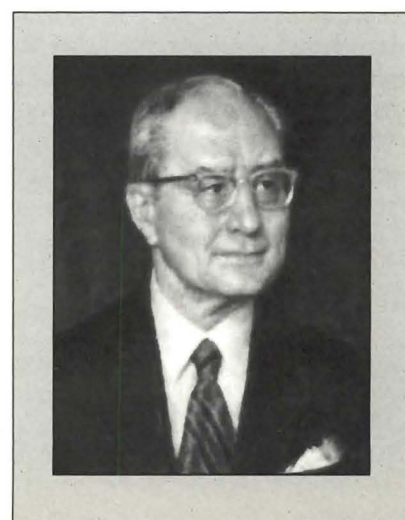
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Dental school dean



University retirement

For the busy reader

Twenty-one years of child advocacy: An editorial retrospective of the Teuscher years—page 18

This paper provides a selective overview of some issues and topics covered in the *Journal* during the past twenty-one years, with particular emphasis on the role of editor George Teuscher in fostering a unique voice of advocacy for children. A diminishing role for the dentist as a cavity repairman was predicted in light of the changing profile of the modern dental patient. Child behavior, development, and learning theory are intertwined in pediatric dentistry, and have been examined in evolution during the last two decades. Similarly, professional/government relations and the marketplace; education in society; and ethics, social responsibility, and the special patient have been ongoing editorial themes presented to the parent organization's membership/readership, the pediatric dentists for the children of today and tomorrow.

Requests for reprints should be directed to Dr. Donald W. Kohn, Sherman Medical Building, 136 Sherman Avenue, New Haven, CT 06511.

A generation of dental services for children: change and similarity—page 24

In the last twenty years or so there have been numerous changes for pediatric dentistry in particular. These changes included the areas of dentists' and children's numbers; in the prevalence of dental caries; in the use of dental services and dental insurance; dental economics, equipment, techniques, and materials. There is an increasing number of special patients and children at the low end of the

socioeconomic scale. These changes have spanned a generation and have been chronicled very capably during this period by the *Journal's* editor, George Teuscher. Some things remain the same.

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

Preventive dentistry for children: a review from 1968-1988—Journal of Dentistry for Children—page 31

ASDC has advanced dental health for children through the dissemination of knowledge to health professionals through the *Journal* and through a variety of promotional and educational materials and mass media, to the public. Probably the major influence on the reduced prevalence of dental caries has been the availability of the mineral fluoride in community drinking water, in dentifrices, in regularly scheduled application from the dental practitioner, and in self-application with rinses and gels. Overall, the pediatric patient of the late-1980s is a much younger patient than his or her counterpart of twenty years ago. Dental professionals are much different as well.

Requests for reprints should be directed to Dr. Arthur J. Nowak, 507 Mahaska Ct., Iowa City, IA 52240.

Behavioral themes in dentistry for children: 1968-1990—page 38

The successful encounter of dentist and child has

been accomplished with time-tested techniques that were taught in dental schools and modeled by dental faculty. During the last twenty years ledgers of techniques have come into favor with different segments of the profession; nitrous oxide/oxygen was a favorite of premedication-oriented practices, while others relied more on an assertive/aversive behavior philosophy. Many issues could influence a particular dentist's personal conviction about the appropriate way to manage children. In the last 130 issues of the *Journal* in which George Teuscher has served as editor (through the July-August 1988 issue), a total of approximately 130 articles in this 21.5-year period have covered behaviorally oriented themes. Both opinion and science have been influential in fashioning present trends, realities, and understandings in this area. Remaining open-minded is the only reasonable approach to the future.

Requests for reprints should be directed to Dr. Jimmy R. Pinkham, University of Iowa, Department of Pedodontics, Iowa City, IA 52242.

Dentofacial growth and development—page 46

Changes in this area that were noteworthy during the last twenty years altered the way those involved thought, practiced, or investigated. Theoretical growth and development was once thought to be dictated totally by genetics; today mainstream thought acknowledges both genetic and environmental influences—that is, the middle ground of 'epigenetics'. The "airway controversy" is a good example of such assigning of responsibility for facial form. Our understanding of growth is insuffi-

cient to predict its course accurately or to master basic dentoskeletal interactions. Newer diagnostic techniques will be introduced that will require changes in our basic understanding of growth and treatment. There is no substitute for understanding biomechanical principles of tooth movement and eruption, not even better machinery. Continued integration of orthodontics into total patient diagnosis and treatment has the potential to provide better results in many phases of dentistry.

Requests for reprints should be directed to Dr. Henry W. Fields, 1912 White Plains Road, Chapel Hill, NC 27514.

Restoring the oral health of the child—page 56

The *Journal* under editor George Teuscher, reporting on advances in oral health care for children, has been the standard bearer for research in basic science and in the clinical application of new technologies. Restorative dentistry, its materials and techniques, have undergone evolution thanks to the creative clinicians cited in these references. Careful respect for the dental pulp remains a primary precept of restorative care today, especially in the care of the child with a traumatic dental injury. The efforts of George Teuscher and the *Journal's* published authors have enabled us to enter a new world of oral health care for children, developing new landmarks in restorative dentistry and patient care.

Requests for reprints should be directed to Dr. Martin J. Davis, Assistant Dean, Columbia University, 630 W. 168th Street, New York, NY 10032.



Twenty-one years of child advocacy: An editorial retrospective of the Teuscher years

DO RIGHT
AND YOU WILL BE
CONSPICUOUS
—Mark Twain

Donald W. Kohn, DDS

Concurrent with the numerous strides made in the technology of dental care for children during the past two decades, there has been a continuing dramatic evolution in the attitudes and values of the public and the dental profession. This evolutionary process has significantly changed the manner in which dental care is delivered.

The historical record of these changes in scientific knowledge and clinical practice is traced in detail in the editorial writings of Dr. George W. Teuscher, who has served as Editor of this Journal since the January 1968 issue. In his stewardship of the Journal, Dr. Teuscher has sought to bring together reader, author, and editor through the creation of a publication that is at once scholarly and a pleasure to read.¹ Moreover, there has always been an underlying theme of advocacy for children in each issue of the Journal. The editorials appearing over the name of George W. Teuscher give the reader an understanding of the broader contexts in which scientific knowledge and clinical skills can be appreciated.

The purpose of this paper is to provide a selective overview of some issues and topics covered in the *Journal of Dentistry for Children* (JDC) during the past twenty-one years, with particular emphasis on the role of its Editor in fostering a unique voice of advocacy for children.

The editorial themes appearing in 126 issues of JDC during the past twenty-one years can be arbitrarily divided into several categories, including preventive dentistry, child behavior, professional and government relations, the dental marketplace, dental education, or-

ganized dentistry, care for the indigent and disabled, and ethics and social responsibility.

PREVENTION

As Nowak's review in this issue ably attests, the Journal has been a powerful voice for preventive dentistry during the last twenty-one years. The rationale for this vigorous stance by the Journal was stated in 1972, when readers were cautioned about the "prevention pendulum" of waxing and waning enthusiasm for preventive dentistry: "The important reason for supporting prevention is that it is the only course of procedure in health matters that makes any sense."²

The complex challenges to society and to the individual practitioner in implementing an effective preventive program were outlined in a series of editorials pointing out the profession's role in promoting the fundamentals of good health on a national level, the importance of a thorough examination and careful diagnosis, the relative cost and effectiveness of preventive measures, and the importance of an approach to disease that is based on biological, psychological, and sociological factors: "It is no longer conceivable, as it once was, that the responsible dentist can concern himself only with correcting the ravages of dental disease."³⁻⁶ A diminishing role for the dentist as a cavity repairman was predicted in light of the changing profile of the modern dental patient, and the artificial boundaries between oral and systemic disease were identified.⁷

Early cries by politicians for limited national expenditures for health care prompted a review of the

public health benefits of fluoridation and the political issues that prevent its optimal use.⁸ A decade later, the Journal was still advocating fluoridation and preservation of the potable water supply in the face of industrial pollution of public water resources.⁹

The publication of a series of three articles on fluoride dentifrices prompted a poignant and humorous reminiscence on the evolution of modern toothpaste, and a dramatic escalation of silver prices in 1980 provided the impetus for a renewed emphasis on prevention in clinical practice as a viable financial alternative for dental clinicians.^{10,11} The simultaneous appearance of an article by Alice Horowitz and an advertisement for the sale of a dental practice prompted a strongly worded indictment of the popular misconception that only restorative care can be financially rewarding in clinical practice.¹²

On the forefront of preventive dentistry research, a scholarly review of the history of molecular biology traced the elucidation of the double helix of DNA to a prediction of a clinical application of DNA probing in predicting dental disease susceptibility in the foreseeable future.¹³

In a vivid historical review, the true-to-life tale of a society whose actions frequently betray its words is outlined in an editorial published in 1985: "We, the people, shout concerns for our children and the need for providing them with the essentials of good health, excellent educational opportunities, and safe and healthful environments. Unfortunately, the translation is not always on a par with the shouting.

"The promotion of adequate dental care for children must not stop. Our individual voices can help, but our corporate voices are stronger than the product of the parts. The corporate voices should be supported by all who are concerned for the welfare of our children as well as for the welfare of our profession. Individual and corporate minds should remain tuned to the child's still, small voice: I am your future and your strength."¹⁴

CHILD BEHAVIOR

As elucidated by Pinkham in this issue, the Journal has played a signal role in the development of the science and literature of behavioral dentistry. The huge volume of editorial writings as well as the selection of scientific articles in this burgeoning discipline are indicative of the perceived importance of child behavior by clinicians and academicians alike.

The impact of cultural evolution on child behavior was discussed in 1979 when the Editor appealed for more and better research in child behavior: "Under-

standing the atom is child's play compared with understanding the child's play."¹⁵

Compassion in dealing with children was eloquently considered in an analysis of dentists' motivations and techniques employed in caring for young patients, and a professional knowledge of human behavior was advocated to improve substantially the dentist's rapport with patients.^{16,17}

Pharmacologic vs. behavioral approaches to patient anxiety and stress were considered in light of etiology and the long-term consequences of such treatment, and the double-edged sword of pharmacologic management of dental behavior was clearly exposed in a discussion of risks and benefits to patient and practitioner.^{18,19}

As a pioneer in the use of general anesthesia in the management of the selected dental patient, Dr. Teuscher has been able to provide the reader with a unique perspective on the evolution of the doctor-patient relationship as it has been affected by the advance of medical technology.²⁰

In order to appreciate the Teuscher perspective on child behavior, one must not only read him ("What a child is and what he becomes is a composite of all his experiences and all the pathways he has explored, for they leave indelible imprints on the direction and meaning of his life."), but must examine the writing and thinking that informs his work.²¹ Eloquent and scholarly musings on learning theory are based on a thorough knowledge of Piaget; the *Tractatus Politicus* of Spinoza is cited alongside Thomas Carlyle in a discourse on understanding patient's behavior.^{22,23} These discourses are peppered with pertinent quotations from scholarly texts and current periodicals such as *Science*, *Nature*, and the *New England Journal of Medicine*. Stimulating quotes are also amply and strategically distributed throughout each issue of the Journal.

The *magnum opus* of the editorial writings of George Teuscher undoubtedly appears in the area of child behavior and development. In order to fully comprehend the magnitude of this accomplishment, one must gather the issues of the past two volumes of the Journal (Volumes 55 and 56), which comprise a review of the relationships between developmental stages of cognitive skills and the social elements of the child's environment. Beginning with molecular and cellular components of life, foetal development, the plasticity of infant behavior, and the significance of a baby's smile, the author considers the crucial early years of development of intelligence and personality.²⁴⁻²⁸ The early role of interpersonal relationships including the maternal-child bond is examined, as are the emergence of morality

and creativity.²⁹⁻³¹ Normal and abnormal development are also considered.³²

PROFESSIONAL/GOVERNMENT RELATIONS AND THE MARKETPLACE

In the early 1970s the dental profession awakened to find itself under assault by the Federal Trade Commission, which had ambitiously acquired new power enabling it to regulate aspects of professional practice that had heretofore been considered sacrosanct. Previously unheard of issues such as peer review were discussed.³³ The profession was given added impetus to unify as its representative organizations came under the fire of litigation for restraint of advertising and prevention of fee competition, and the leadership of organized dentistry exhorted their colleagues to actively participate, stick together and lend active support.^{34,35} But it was not to be, and one Michael Pertschuk, a lawyer and chairman of the FTC, stripped the privileged position from professionals in the eyes of the law, subjecting them to the regulations of trades, "impal[ing] them on the deception of commercial advertising, and embroiling them in the ruthless competition of business".³⁶ In 1982 Dr. Teuscher wrote, "Never, did more than a thin coat of varnish separate the world of the ethical professional from that of the charlatan. The FTC and the U.S. Supreme Court, now, have removed the varnish."³⁷

Unprecedented inflation plagued the economy of the United States in the late '70s, and the economics of dental care changed as never before. The government and other third parties continued to increase their influence on modes of practice with economic pressure on the individual practitioner. Writing about the challenges of bringing health care to a clamoring public in 1978, Dr. Teuscher wrote, "The point to be made here is that the problems of health and health care cannot any longer be considered the sole responsibility of the health professions. Furthermore, if the concept of prevention is to attain its rightful place in the topic of health, we should move firmly to the task of involving and bringing together, as a beginning, the leadership of the health professions, education, the community, and government, in order to shape a realistic health policy."³⁸ He advised the young dentist seeking new markets for dental care not to neglect "the basic responsibilities of a professional's life: competence; availability; compassionate and understanding service at fair fees; interest in the welfare of the community (big or small); devotion to ones family and home," and wrote skeptically that, "whenever ethics becomes a heated issue, there is some larger cultural process taking place,

of which a concern with morality is only one symptom."^{39,40}

Shifting modes of dental practice were further dictated by changing patterns of dental disease, most particularly a decline in the rate of dental caries. A peremptory challenge by orthodontists to limit the performance of orthodontic procedures by pedodontists was rebuffed, and the role of the conscientious general practitioner in the provision of dental care for children was championed.^{41,42} Continuing in this politically sensitive vein, the role of the pediatric dental specialist was examined, as was the key to a successful general practice, "From a purely long-term economic standpoint, it is essential that the general practitioner include a sizeable core of children in his practice, and, further, that he stay abreast of new knowledge that can affect the treatment of children."^{43,44} The combination of pedodontics and orthodontics in clinical practice as originally proposed by Sidney Kohn was again explored, as was the working relationship between general practitioners and pediatric dental specialists.^{45,46}

Market forces prompted some dentists to change the emphasis of their practices to "cosmetic" services perceived as more remunerative, prompting the cautionary statement that, "neither the American public nor their representatives in government, can be convinced of the great importance of dental health, if dental care is promoted primarily because of its cosmetic value," while adding that, "as clinicians we touch the most psychologically vulnerable spot of the patient or parent—his cosmetic concern."⁴⁷

Observing and commenting on the acceleration of the social revolution, a series of editorials weighed the potential impact of such rapid change in values and systems. A clear national health policy, as opposed to arbitrary change, was advocated, and colleagues were again reminded that "the enduring accomplishments of the dental profession occurred by its members acting cooperatively, not by their acting competitively."^{48,49} Expanded duties for dental auxiliaries was considered, pro and con, and the preservation of high standards of professional education and patient care was identified as the litmus test for approval.⁵⁰

Throughout the phenomenal change in the dental practice environment during the past two decades, one could always look to the editorial pages of the Journal for a word of encouragement, historical perspective, and vigorous support.^{51,52} In the final analysis there was always the reminder that, "for the moment, it seems appropriate that we reassert our faith and our confidence in high quality performance of health service; that we take steps to modernize our office procedures; and that we recognize our responsibility to keep abreast

of new knowledge. The ability to provide a quality service is one of man's greatest gifts; to fail to provide it, one of his greatest mistakes."⁵³

EDUCATION

The careful reader of the *Journal of Dentistry for Children* has had an opportunity to be exposed to the wisdom and wit of a superb teacher who is manifestly interested in the process and substance of education. In 1975 Dr. Teuscher wrote forcefully on the debacle in American education and the failure of American colleges to provide for the needs of society as a whole.⁵⁴ The implications for dental education were dire, the results of which are now evident in the diminishing quality and quantity of applicants to a continually declining number of professional schools. The challenge of providing an environment in which the growing child can realize his or her full potential has direct implications for the individual, society, and the profession, and the importance of language and literacy to this process is cardinal: "Unless the conditions of American education are greatly improved, the health professions will eventually be staffed by a majority who will be, for all practical purposes, scientifically illiterate. And at best, health professionals will comprise an island of literates existing in a sea of illiterates."^{55,56}

The inveterate Editor/teacher has used the *Journal* as an educational tool to stimulate and cajole his readers to ponder and to learn. Whether by engaging the reader in a "wet-fingered" discourse on changing concepts of retention in restorative dentistry, or by challenging conventional wisdom with the publication of controversial papers of dubious scientific merit, he has piqued our curiosity and cleverly taught us to carefully and critically evaluate the printed word: "There appears to be general acceptance that publication provides assurance that information contained in the paper is true, reliable, and valid."⁵⁷⁻⁶¹ Proof of this lies in the fact that poor research articles are quoted as frequently as those reporting significant research."⁵⁸

Thus has our Editor been faithful to the principle set forth in his first editorial in 1968: "Editors have a responsibility to the readers of their journals to lure them into a manuscript they might not normally read, and to make it so proficient that they will be carried along by it and introduced to new ideas, new concepts, perhaps new experiences they might not obtain otherwise."¹

Readers of the *Journal* have also had an opportunity to learn about teaching, as in this wry commentary on the challenge of patient education: "Like the fabled mule who would accept kindness only after he was hit with a board to get his attention, the public seldom

responds to a purely academic explanation of a problem...Like the mule, the public's attention must be aroused by a more plebeian expedient than a simple and factual presentation. Advertisers know this; but health professionals talk with their patients on the level of a rational, intelligent relationship."⁶²

ETHICS, SOCIAL RESPONSIBILITY, AND THE SPECIAL PATIENT

The *Journal of Dentistry for Children* has, through its parent organization, inherited a mandate and tradition of child advocacy. The pioneering scientific articles published here during the past two decades on such subjects as child abuse and neglect, prevention of accidental injuries, care of the medically compromised child, and care for the indigent and developmentally disabled, suggest issues of overwhelming social significance that have been addressed on the editorial pages of the *Journal*. These thoughtful and compassionate writings establish a high standard for ethical professional behavior.

In a series of editorials on the dentist's role in the problem of the battered child, Dr. Teuscher wrote, "The spectrum of responsibility for the professional person spans ever more facets of society and continually changes the face of his profession."⁶³⁻⁶⁵ The hallmark of the dental profession—the restoration of teeth damaged by disease or trauma—is still eminently prominent among the professional skills of a dentist. Although the importance of restorative skills has not diminished, it takes less than a sharp eye to perceive the pervasive forces which are molding a new profile for the dental profession."⁶⁵

Issues of concern often have concerned him passionately. Case reports of uncommon disorders have been selected for publication for the purpose of enhancing patient care rather than the exploitation of a mere curiosity. In 1977, in a special issue devoted to management of burns, Dr. Teuscher wrote, "Even the most experienced clinician, grown tough from many years of treating thousands of children, must feel some surge of emotion, when faced with helping the victims of accidents, such as those described in the articles on burns, in this issue of the *Journal of Dentistry for Children*."⁶⁶

In the waning summer months of the Vietnam War, he echoed the nation's sense of frustration ("More than anytime in our memory, society has been censured, caviled, and blamed, collectively and individually, for every social ill, real or imagined. We have forgotten how to measure and evaluate what is good"), suggested that education, health, hunger, and poverty might be appropriate national priorities, and offered words of encouragement: "think about your role in our good old

world, not in our bad old world; think about how you can make it a better world, but draw not a cloak of guilt about your shoulders for all of its basic faults. Think about the good that you have done and how you may do more; and if you reach beyond your immediate professional responsibilities and touch society at the roots of its big problems, so much the better."⁶⁷ Fifteen years later, reflecting on the significant progress we have made toward the elimination of dental caries, we were reminded that millions of the world's children are still beset by disease, poverty, and ignorance: "As long as these conditions remain and flourish, no compassionate and understanding person can claim immunity from responsibility or disclaim a role in the scenario that recognizes the intricate network of the problems of children."⁶⁸

THE AMERICAN SOCIETY OF DENTISTRY FOR CHILDREN

As the official publication of the American Society of Dentistry for Children, the *Journal of Dentistry for Children* has endeavored to further the Society's unique mission. In 1973, Dr. Teuscher wrote, "We choose to believe that the basic philosophy of ASDC attracts many dentists to the ASDC fold. That philosophy casts dentists and dentistry in a role which encompasses much more than private practice, teaching, or research; each of which may enslave one to a life of intellectual and social narrowness. The ASDC philosophy assumes the need for a practical approach in the treatment of people's dental ills; but it also recognizes the greater importance of preventing dental disease, individually and socially. It recognizes the fact that through treatment, education, and training of children in good hygiene practices, society has the greatest opportunity to conquer and control dental maladies. It has been the acceptance of this philosophy by many dentists throughout the world that has attracted them to ASDC. For many, ASDC has been the shield which has given them courage to do battle for the cause of dentistry for children and has led them to success in awakening a dental faculty, a dental society, or a community to the important role of dentistry for children in building a generation of healthy adults."⁶⁹

The fiftieth anniversary of the founding of ASDC, in 1977, provided occasions for reminiscence and reflection on the birth and development of this unique organization, and contemplation of the future of a Society for all dentists interested in the promotion of dental health for children.⁷⁰ During that anniversary year, our Editor noted that, "The contributions of ASDC to the promotion of dentistry for children and to the scientific growth of dentistry for children are unique in the an-

nals of dental organizations. It may be the only dental society in the world whose members have sought no material benefit for themselves; but have worked for happier and healthier lives for children."⁷¹ The role of such a professional society in a profit-oriented, highly competitive healthcare marketplace was discussed in 1985: "Strong, cohesive associations are needed to inform the public about health care and to present to the public the image of skilled and compassionate practitioners who may differ with government and corporate proposals in how best to serve society, but who are, nevertheless, sincere and selfless in their beliefs. And associations are needed, furthermore, to provide a forum for their members for purposes of learning and discussion."⁷²

SUMMARY AND CONCLUSIONS

On the eleventh anniversary of his Editorship of *JDC*, Dr. George Teuscher took stock of the state of the *Journal*, noting progress made and challenges ahead, writing that, "A good journal cannot ride on its reputation... Constant effort to improve, resourcefulness, and prolific reading and study are required of the editor of a prestigious journal."⁷³ He has written extensively on the importance of writing and effective communication in the face of an information explosion, stating that, "The journal is still the best means of presenting new information to the professions."⁷⁴⁻⁷⁷

Writing a note of encouragement to the editor of a new dental journal, he observed, "Of course the dental and medical literature can boast of some great editors, who earned their reputations because they were able to apply intelligence, writing ability, knowledge of the scientific method, and imagination to a new undertaking."⁷⁷ After twenty-one years, it is safe to say that Dr. Teuscher is such an Editor; he has filled our minds with knowledge and our hearts with wisdom; he has reminded us of the best that is in us; he has helped us to feel the anguish of the afflicted and oppressed; he has brought knowledge and skill to help the infirm; and he has taught us to stand in awe before the mystery of being.

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A generation of dental services for children: change and similarity

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The nation's supply of dentists declined sharply between 1950 and the 1960s.¹ The nation's supply of dentists increased sharply during the 1970s and 1980s. Projections for the 1990s and beyond indicate a marked decline in the nation's supply of dentists.² Could it be that, "The more things change, the more they remain the same?"

Do you remember dentistry in the 1960s, specifically in the later 1960s when Dr. Teuscher assumed editorship of the Journal? Dental advertising and commercial dentistry did not exist. The annual number of applicants to schools of dentistry increased from nine to ten thousand for the gradual increasing number of entering first year places (from 3,616 in 1960 to 4,200 in 1968³). In some years during the 1960s, as many as fifty women were admitted throughout the nation to first year dental school classes. It was not until 1971 that more than one hundred women entered first year classes.⁴ Independent practice by dental auxiliaries was something that involved dental nurses in New Zealand. Health insurance companies were too busy expanding major medical expense coverage to direct much attention to fledgling dental insurance plans.⁵ The American Dental Association (ADA) had lobbied "successfully" to keep dentistry out from Medicare — that menace to independent dental practice.⁶ The average pediatric dentist (nee pedodontist) earned \$26,622 while the average dental specialist earned over thirty one thousand dollars.⁷

And would you believe that in 1967, 1) 42 percent of pediatric dentists reported their patients had to wait one week or less for an appointment, and 2) 72 percent of pediatric dentists felt that they were not overworked

or were not busy enough?⁷

Yes, in the last twenty or so years there have been a great number of changes in dentistry in general, and pediatric dentistry in particular. But for both the general practitioner active in child care and the pediatric dentist in the first years of the 1990s, the proverbial "bottom lines" are not that different from those of the generalist and pedodontist in the late 1960s.

THE NUMBER OF CHILDREN

In the late 1960s, children represented over a third of the total population of the nation. As a result of changing age demographics, by the 1990s, only a quarter of the general population is under eighteen years of age. While the number of children decreased from almost 71 million in 1968 to less than 64 million in 1980, during the 1980s, however, the actual number of children stabilized with forecasts for numeric growth during the 1990s (Table 1).

CHANGES IN THE PREVALENCE OF DENTAL CARIES

During the past twenty years, major changes have occurred in the dental disease pattern of most children — in particular, a reduction in dental caries. There has been a continuing decline in the prevalence of caries in primary and permanent teeth for children of all ages. Most important in the decrease in dental caries has been the availability of fluoridated water supplies and fluoride supplements in dentifrices and in a series of

Table 1 □ Population under eighteen years of age and percent of total population: selected years 1968-2000.^{8,9}

	1968	1975	1980	1990*	2000*
Number (in millions)	70.8	66.3	63.9	64.0	65.7
Percent of population	35.4	31.3	28.2	25.6	24.5

*Projected

Table 2 □ Average number of decayed (d), nonfunctional carious teeth (e) and filled (f) primary teeth: 1971-74.¹²

Age	Mean number def teeth
(In years)	
2	0.2
3	0.8
4	1.7
5	2.2
Average: 1-5	1.0
6	3.3
7	3.5
8	3.7
9	2.8
10	2.1
11	1.2
Average: 6-11	2.7

Table 3 □ Prevalence of caries in primary teeth by age: 1979-80 and 1986-87.^{13,14}

Age	Mean decayed filled surfaces	
	1979-80	1986-87
5	4.03	3.40
6	4.76	3.73
7	5.52	4.20
8	6.11	4.24
9	5.95	3.89
Total	5.31	3.91

Note: Change in reporting format prevent comparisons with earlier periods.

other regimens. Between the late 1960s and the mid 1980s, the percent of the population receiving optimally fluoridated domestic water increased from less than 40 percent to 52 percent.^{10,11} Nearly 90 percent of all dentifrices sold during 1981-85 contained fluoride.¹⁰ And a large number of children participate in school-based fluoride mouth rinse programs and fluoride containing mouth rinses are available for home use. In addition, fluoride is provided in the form of tablets, drops, and topical application in dental offices. And further, the placement of dental sealants has proved effective in the prevention of dental caries.

Children below the poverty line and nonwhite children use less fluoride supplements, however, than their respective counterparts above the poverty line and white children.¹⁰

(Note: continual changes by federal agencies and the ADA in data reporting formats limit uniform comparisons during the last twenty to twenty-five years.)

Table 4 □ Prevalence of caries in permanent teeth by age for children: 1971-73 and 1986-87.^{13,14}

Age	Mean decayed missing filled surfaces	
5	0.15	0.07
6	0.41	0.13
7	0.69	0.41
8	1.86	0.71
9	3.59	1.14
10	4.14	1.69
11	4.58	2.33
12	6.36	2.66
13	8.67	3.76
14	9.60	4.68
15	11.67	5.71
16	15.12	6.68
17	16.90	8.04
All ages	7.06	3.07

Table 5 □ Percent of DMFT due to decayed, missing and filled teeth: 1971-74 and 1979-80.^{12,14}

Age	Decayed		Missing		Filled	
	'71-'74	'79-'80	'71-'74	'79-'80	'71-'74	'79-'80
7	80.0	41.9	0.0*	0.3	40.0*	57.8
9	42.8	25.3	9.5*	0.6	47.6	74.1
11	40.7	23.2	11.1	1.0	51.8	75.7
13	36.0	21.5	8.0	2.1	54.0	76.4
15	28.5	17.5	11.1	2.3	60.3	80.2
17	25.2	13.5	12.6	3.2	62.0	83.3

* Relative standard error was 25 percent or more.

Table 6 □ Percent of DMFS due to decayed, missing and filled surfaces: 1979-80 and 1986-87.^{13,14}

	1979-80	1986-87
Decayed	16.8	13.4
Missing	7.1	4.3
Filled	76.1	82.3

Note: Changes in reporting format prevent comparisons with earlier periods.

- In the early 1970s, children between one and five years of age had an average of 1.0 decayed, non-functional carious and filled (def) primary teeth. Eight-year-old children had an average of 3.7 def primary teeth. Children between six and eleven years had an average of 2.7 def teeth (Table 2).
- During the 1980s, the average decayed and filled surface rate for primary teeth of children between five and nine years decreased from 5.31 to 3.91 (Table 3).
- Between 1971-73 and 1986-87, the average decayed, missing and filled surface (DMFS) rate for permanent teeth of children between five and seventeen years decreased from 7.06 to 3.07 (Table 4).
- There has been an increase in the filled component of the DMF surface and teeth rates (Tables 5 and 6).

- Results from the 1986-87 national dental study of school children indicated that children who had always been exposed to community water fluoridation had DMFS scores about 18 percent lower than those of children who had never lived in fluoridated communities (Table 7).
- During the 1980s, in each age-group between five and seventeen years, the percent of children who were caries-free increased. Overall, the percent of all school age children who were caries-free increased from 36.6 percent to 49.9 percent.^{13,14}
- Despite the major decrease in dental caries rates, nursing or nursing bottle rampant caries still exists. Determining the true prevalence of nursing caries is difficult because of the inaccessibility of children for examination. Reports from some Head Start programs, however, indicate rates ranging as high as 50 percent or more for children between three and a half and five years of age; and even higher rates for native American children.^{15,16}

OTHER DENTAL DISEASE PATTERNS AND DENTAL SERVICE NEEDS

While there have been dramatic decreases in rates of dental caries, dental treatment needs still exist throughout the general population. Results from studies during the 1980s indicate that:

- Almost a quarter (24 percent) of white children and a third of nonwhite children required restoration in their permanent dentitions; even greater percentages (30 percent and 40 percent, respectively) required restorative services for their primary dentition. In addition, extractions, crown replacements and pulpal treatment were required. And treatment needs were greater for residents of nonstandard metropolitan statistical areas.¹⁷
- Ninety-two percent of all school children had mild or moderate gingival inflammation. Severe gingival conditions, which warranted the special attention of a general dentist or periodontist were reported for 3 percent of children.¹⁷
- In 1970, 25 percent of children twelve to seventeen years of age were reported to have a malocclusion; 29 percent had a severe or very severe malocclusion. By 1979, five million children (11.7 percent) were receiving or had completed orthodontic treatment.^{17,18}
- Children less than ten years of age, and children between eleven and twenty years account, re-

Table 7 □ Mean DMFS of children with permanent teeth by age and water fluoridation exposure: 1986-87.¹⁰

Age	Lifelong water fluoridation exposure	No water fluoridation exposure	Percent difference
5	0.03	0.10	70
6	0.14	0.14	0
7	0.36	0.53	32
8	0.64	0.79	19
9	1.05	1.33	21
10	1.64	1.85	11
11	2.12	2.63	19
12	2.46	2.97	17
13	3.43	4.41	22
14	4.05	5.18	22
15	5.53	6.03	8
16	6.02	7.41	19
17	7.01	8.59	18
All ages	2.79	3.39	18

Table 8 □ Percent of children with a dental visit within the past year: selected years 1969-1986.²²⁻²⁴

Age (In years)	1969	1978/79	1983	1986
Under 5	11.0	14.3		
2-4			28.4	33.5
5-14	58.8	64.2		
5-17			67.0	71.5

Table 9 □ The percent distribution of children by the time since last dental appointment.^{22,23,25}

Last visit	Under 17 years			
	1969	1975	1981	
Under 6 months	32.1	36.6	35.2	
6-11 months	13.4	14.8	13.8	
1 year	9.9	9.6	10.8	
Subtotal	55.4	61.0	59.8	
Never	35.5	30.0	30.4	

Last visit	2-4 years		5-17 years	
	1983	1986	1983	1986
Less than 1 year	28.4	33.5	67.0	71.5
1-2 years	2.8	2.7	11.7	8.5
Subtotal	31.2	36.2	78.7	80.0
Never	64.2	62.9	8.9	7.7

Table 10 □ Number of dental visits per child: selected years 1969-1986.^{22-24,26}

	1969	1978/79	1983	1986
Under 5 yrs.	0.3	0.4		
2-4 yrs.			0.7	0.7
5-11 yrs.			2.1	2.0
5-14 yrs.	1.8	2.0		
12-17 yrs.			2.9	2.8

Table 11 □ Number and percent of persons with dental insurance: 1968, 1980, 1986.^{5,29}

Year	Total Number	Percent of total population	Percent of all children		
	(in thousands)		Age		
			2-4 yrs	5-11 yrs	12-17 yrs
1968	5,867	2.9			
1980	79,433	34.9			
1986	94,976	39.3	40.2	42.8	43.1

spectively, for 4-5 percent and 20 percent of all facial skeletal fractures. In children, between 50 and 65 percent of orofacial trauma results from sports activity; 10-15 percent from motor vehicle accidents; and 5-10 percent each from assaults and falls. Trauma to the head and associated areas occurs in approximately 50 percent of the cases of physical abuse of children.¹⁹⁻²¹

USE OF DENTAL SERVICES

Despite the continuing decrease in the prevalence of dental caries since the late 1960s, there has been an increase in the use of dental services by children of all ages.

- During the past twenty years, the percent of children in all age-categories with a dental visit in the past year increased (Table 8).
- The percent of children who never visited a dentist decreased (Table 9).
- The number of dental visits per child varied minimally (Table 10).

The increase in the use of dental services by children was for a wide variety of demographic groups by age, gender, race and family income groups. Throughout the 1970s and 1980s, however, there were differences within the various demographic groups.

- A greater percent of female children, than their male counterparts, had reported dental visits.
- A greater percent of white children, as compared to their black counterparts, had dental visits in the previous year.
- There was a direct relationship between increased family income and the percent of children of all ages with reported dental visits in the previous year.^{22-24,26}

PRIVATE DENTAL INSURANCE AND THE USE OF DENTAL SERVICES

In 1968, less than 3 percent of the entire population had dental insurance. By 1972, only 2 percent of national dental expenditures were covered by private dental insurance programs.^{5,27} In the second half of the 1980s, almost 40 percent of the general population had private insurance that provided for 37 percent of dental costs.^{5,28} In 1986, a greater percent of children in all age-categories, than the general population, had insurance for dental expenses (Table 11). And dental insurance was a factor in the use of dental services. A greater percent of children with private dental insurance, than their uninsured counterparts, had reported dental visits in the previous year.²²

Table 12 □ Dental school applicant data: selected years 1968-89.^{2,31,32}

	1968	1975*	1978**	1988	1989
Number of dental schools	52	59	60	57	55
Number of applicants	9,037	15,734	11,753	5,019	
First year students	4,203	5,763	6,301	4,196	4,055***
Number of applicants per first year enrollment	2.2	2.7	1.9	1.2	
Percent of applicants enrolled in first year class	46	37	54	84	

*Year with most applicants.

**Year with most first year students.

***Estimated.

Table 13 □ Number of students of, and graduates from pediatric dental training programs: selected years 1968-1988.³³⁻³⁵

	1968	1970	1980	1988
First year enrollment				
Dental school	95*	103	138	120
Non-dental school		29**	52	42
Total		132	190	162
Total enrollment				
Dental school	157	208	281	256
Non-dental school		68**	96	79
Total		276	377	355
Graduates				
Dental School	63	92	122	102
Non-dental school		20**	45	34
Total		112	167	136
Number of accredited pediatric dental training programs				
Dental school			41	37
Non-dental school			23	18
Total			64	55

*1969 data

**1971 data

THE CHANGING PRODUCTION OF DENTISTS AND PEDIATRIC DENTISTS

The past twenty-year "rollercoaster-ride" approach to the production of dentists has been as scary as its amusement-park namesake. First, there were increases in the numbers of schools and first-year entering places to meet anticipated shortages (and maybe federal government efforts to create a surplus of dentists to increase the potential for competition and a lowering of prices?).

Then an economic recession, an oversupply of dentists, decreases in office busyness, fewer young men and women applying for admission to the profession; and now, massive decreases in the number of entering places, the closure of five schools of dentistry and forecasts of shortages of dentists in the next decades (Table 12).³⁰

During the past two decades, the production of pediatric dentists mirrored the "boom-and-bust" approach to dental manpower planning. Throughout the 1970s, there were marked increases in the numbers of students in, and graduates from pediatric dental programs. In the 1980s, this was followed by decreases in the numbers of students and graduates from pediatric dental training programs; and decreases in the number of training programs themselves (Table 13).

The 1970s increases in the production of pediatric dentists resulted in a marked upswing in the total number of pediatric dentists and in the ratio of pediatric dentists to population size. The 1980s downturn in the number of graduates has been too recent to affect current pediatric dentist numbers and population ratios (Table 14).

The overall results of the changing numbers of pediatric dentists and perceptions of the evolving environment for pediatric specialty practice have resulted in marked decreases in the numbers of senior dental students expressing an interest in pediatric dental training programs (Table 15).

PRACTITIONER INCOME

Unfortunately, limited long-term data are not available on the economics of pediatric dental practice.⁴¹ National dental expenditure information for 1968 and 1988, however, indicate a favorable "bottom line" economic picture of dental practice. In the period from the late 1960s to the late 1980s, despite increases in the number of practitioners and a marked decrease in the net income to gross receipt ratio, there were increases in 1) constant dollar (i.e. removing the effects of inflation) expenditures per active dentist and 2) constant dollar net income (Table 16).

OVERVIEW

In the last twenty years, new equipment, materials and techniques have improved dramatically the ability of the pediatric dentist to provide needed dental services. But for pediatric dentists (and dentists in general), it is the changed environment for the delivery of these services that is both disturbing and perplexing.

The changes in the number of children and decreases in the incidence and prevalence of dental caries need to be considered against a background of increasing demand for dental services, increases followed by decreases in the production of general and pediatric dental practitioners, greater availability of dental insurance coverage, advertising, commercial practices and a new world of increased sizes of dental practices, litigations, closed panels, preferred-provider arrangements, health maintenance organizations and a seemingly endless array of practice modalities in today's alphabet soup of health delivery and third-party oversight programs.

In addition to these and so many other developments that are affecting the current and future practice of dentistry, the particular training and experience of pediatric dentists are being called upon to provide care to the increasing numbers of special patients. An increased population of the developmentally disabled,

Table 14 □ Number of pediatric dentists and pediatric dentists per million population.³⁶⁻³⁸

Year	Number	Pediatric dentists Per million pop.
1970	1,159	5.7
1979	1,776	7.9
1987	3,089	12.7

Table 15 □ Number of senior dental students expressing an interest in pediatric dental training programs: 1978, 1980, 1989.^{32,39,40}

Year	Number
1978	122*
1980	126**
1988	87***

Note: Comparable data are available for earlier periods.
 *Based on 2.3 percent of 5,324 graduates.
 **Based on 2.4 percent of 5,256 graduates.
 ***Based on 18.9 percent of 4,581 graduates who were interested in specialty programs, and the 10.1 percent of this subgroup interested in pediatric dentistry.

Table 16 □ Current and constant* dollar expenditures and net income per active dentist: 1968, 1988.^{1,2,7,42-44}

	1968	1988
Professionally active dentists	100,013	138,749
National dental expenditures (billions)	\$3.8	\$37.0
Current dollar expenditure per active dentist	\$38,205	\$266,668
Consumer Price Index (1967 = 100)	104.2	348.3
Constant dollar expenditure per active dentist	\$36,665	\$76,562
Net income as a percent of gross income	53.3%	34.7%**
Constant dollar net income based upon national expenditures	\$19,542	\$26,567

*Removal of the effects of inflation.
 **1987 data, average of 34.1% for independent practitioners and 35.3 for solo practitioners.

the chronically ill and acutely ill, the hospitalized, the high-risk patient, the child with AIDS, and the survivors of medical conditions who previously succumbed to a seemingly endless range of pathologic conditions, as well as the child with fetal-alcohol and addictive-drug syndromes, is expanding the dimensions of pediatric practice.⁴⁵

But while pediatric and general practitioners continue to provide services to increasing segments of our nation's children, large numbers of children below or near the national and state poverty levels are denied services. Minimal government efforts and expenditures for dental services (particularly under the Medicaid program) have done little to ensure the oral health status of the child in a low-income family.⁴⁶

But as our nation continues to emphasize the health and social needs of the geriatric population, increasingly, voices are drawing our attention to the needs of children. As former Surgeon General Koop noted:

"...I think there are two very powerful—potentially negative—influences on the future of child health support in this country: First, the fact that children will no longer dominate our demographically based health planning, and ...

Second, the fact that a significant number of all children will be at the low end of the socioeconomic scale.

I think this adds up to a major challenge for public health leadership in our society."⁴⁷

Surely our country will continue to recognize the need to provide for our children!

But fortunately, despite the vicissitudes of change reeling about the dental profession in the past twenty to twenty-five years, the proverbial "bottom lines" of pediatric dentistry have remained constant; i.e.

- The ability and desire of highly trained and motivated professionals to provide needed health services for the youth of our communities.
- An improving economic return for these practitioners.

It seems almost beyond belief that one editor could have chronicled, so ably for a whole generation, the changes and similarities of pediatric dentistry. Well done and thanks, George!

And what of the next generation of pediatric dentistry? Undoubtedly, continued changes will be in our future. But would we want it to be any different?

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CURIOSITY, IMAGINATION, AND CREATIVITY

Curiosity, imagination, and creativity in children make a powerful three-part force that constantly pulls them upward to new levels of maturity. This will show up in their schoolwork, in their future jobs, and in their lives generally.

In infancy, curiosity comes first. It is eager and inexhaustible. It can be seen in the fixed gaze that two-, three-, and four-month-old babies direct at an object, say a toy or mobile hung above the crib. It is shown in the stirring of the baby's still-inexpert arms as she feels the impulse to reach out and touch the object, though she has nowhere near the skill needed to accomplish this yet.

From the middle of the first year, curiosity extends from eye to hand. Objects are turned over and over, banged experimentally against the furniture, brought to the mouth for tasting. The constant tasting reminds us that most other animals have to do all their exploring with nose and mouth. How frustrating this seems to us!

In the second year, as crawling and walking make it possible, curiosity drives children to endless explorations of places like cupboards, drawers and closets. They test bodily skills by climbing up stairs and onto furniture, by pushing and pulling everything that's not nailed down, by experimenting with containers as they set out to find if small containers will fit into large ones and if large ones will fit into small ones. The answer to the latter seems obvious to adults, but the child has to try it again and again.

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Preventive dentistry for children: a review from 1968-1988 – *Journal of Dentistry for Children*

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A major goal of the Society since its inception in 1927 has been to advance dental health for children through the dissemination of knowledge to health professionals and to the public. The Society has primarily utilized its journal (*Journal of Dentistry for Children*) to reach the health professional and a variety of promotional and educational materials and the mass media to reach the public.

For over twenty years our editor has had the responsibility to the readers of the Journal to provide information on a wide variety of topics pertaining to dentistry for children. Early in his tenure he stated, "editors should know what people are talking about; and that is what should be published in their journals. They should be putting out front what they think is interesting and what is important to their readers."¹

We have been charged by the associate editors to summarize the progress made in the discipline of pediatric preventive dentistry over the last twenty years and emphasize the role that our Journal has had in informing and guiding its readers in practicing and promoting its use in private practice, and in educational and institutional settings.

BACKGROUND

A pediatric patient of the late-1960s was considerably different from the patient of the late-1980s. As reported earlier, the most dramatic change has been in the reduction in dental caries. Nevertheless, 50 percent of school-age children still exhibit dental caries.² In ad-

dition there are large numbers of special populations who continue to demonstrate oral disease rates that contribute to their inability to eat properly or function in the class room. These special populations include the poor, the American Indians and Eskimos, the infants and toddlers who continue to be bottle- or breast fed after the primary teeth begin to erupt, children who are chronically ill, developmentally disabled, or who have undergone major medical therapy for life threatening diseases, the neglected and abandoned child, and the independent adolescent who has left home.

Accessibility to dental care has improved over the last twenty years. Third-party reimbursement has allowed for dental treatment and regular follow-up for large numbers of the population. Parents of pediatric patients are encouraged to schedule children for a dental visit at a much earlier age than suggested in the 1960s.

But probably the major influence on the reduced prevalence of dental caries, has been the availability of the mineral fluoride in community drinking water; in dentifrices; in the office, professionally applied on a routine schedule; and self-application at home or in school, in the form of oral rinses and gels. Although other preventive measures have had an impact on dental disease, systemic and topical fluorides have had the greatest overall effect on caries reduction.

Overall, the pediatric patient of the late-1980s is a younger patient. Parents, physicians, and dentists have realized that for the preventive effect to have its greatest impact on the child, it must begin before the start

of the disease process. Parents are receiving, therefore, preventive information at prenatal classes and again at parenting classes.³ They are encouraged to schedule their child's first dental examination shortly after the eruption of the first primary tooth so that the dentist can counsel them on appropriate fluoride therapy, oral hygiene practices, and dietary regulations.⁴⁻⁶

The dental professional of the '80s is also quite different from the professional of the '60s. A preventive orientation as compared to a disease orientation is widely practiced in many offices across the country. The dentist of today has responsibility to inform patients/parents that they are and can be responsible for their oral health, and with appropriate professional supervision can enjoy a lifelong disease-free mouth. Where in the 1960s, only two major textbooks in Pediatric Dentistry were available to the practitioner, today there are a number of well written and frequently updated textbooks for all levels of expertise so that the dental practitioner can remain current with the everchanging concepts in oral disease and its prevention.

In addition, the family practitioner has over three times the number of pediatric dentists available to him in the late 1980s, to whom to refer the more complicated high-risk patients for specialized care. In concert with the family practitioner, specialists can manage and coordinate a level of care convenient to parents, while maintaining the patient at the highest level of oral health.

Only a few commercial products with formulae based on research that demonstrated the preventability of dental disease were available to the pediatric patient of the 1960s. Only one of the five top-selling dentifrices contained fluoride. Although fluoride tablets for supplemental use were available, only a small percent of the infants and toddlers who could profit by their use actually received them. Toothbrushes were not readily available in the size and design to facilitate proper brushing in the pediatric patient. Daily fluoride rinses for home use were not yet available for distribution. Sugarless gums and candies were few in number and not easily available to most consumers. Disclosing solutions were only beginning to be marketed and occlusal sealants were not yet approved for use by the dental profession. Although topical fluoride for professional application in the office was available, the application systems were crude and made delivery difficult and lengthy.

The typical dentist of the '50s and '60s was oriented, because of training, to the technical control of dental disease. Many were not trained in the dynamics of personal motivation and were unable to communicate effectively the need for the preservation of the dentition

and surrounding tissues. The dentist was well trained in the diagnosis and repair of the effects of disease, but it became a challenging and frustrating effort to educate and motivate patients and parents in the principles of preventing oral disease. It was also difficult for patients/parents to realize that dental disease could be prevented and that the major effort was their responsibility and not the responsibility of the dental professional.

It was in this environment that our editor took over the leadership of the Journal. His predecessor had been editor for over twenty years and provided the readership with many of the early reports on the prevention of dental disease through daily oral hygiene and the use of fluorides. Nevertheless, Dr. Teuscher had the responsibility to bring to the readership the information and research that would assist in the development and promotion of a preventive philosophy for the pediatric patient.

METHODOLOGY

All issues of the *Journal of Dentistry for Children* from 1968 (Volume 35) through 1988 (Volume 55) were reviewed and the articles pertaining to preventive dentistry selected for evaluation. The articles selected were further categorized in one of the following subgroups: 1. Caries/plaque/bacteria, 2. Fluorides, 3. Occlusal sealants, 4. Dietary counseling and recommendations, 5. Patient/Parent education, 6. Oral hygiene techniques, 7. Oral hygiene devices.

In addition, the commercial products advertised in the same journals were noted. Only products that supported a preventive philosophy were selected. The products selected were further categorized into one of the following subgroups: 1. Dentifrices, 2. Home fluoride products, 3. Office fluoride products, 4. Brushing devices, 5. Sugarless gums and candies, 6. Occlusal sealants, 7. Dental floss.

RESULTS

Scientific articles

A total of 1,099 articles were published in Volumes 35-55. One hundred seventy-one or 16 percent were related to preventive dentistry. Articles on oral pathology and syndromes made up the largest group of articles, 268 or 24.4 percent. The remaining topics in the top five were: orthodontic/growth and development, 154 (14 percent); behavior management, 133 (12 percent); and rehabilitative dentistry 109, (9.9 percent) (Figure 1).

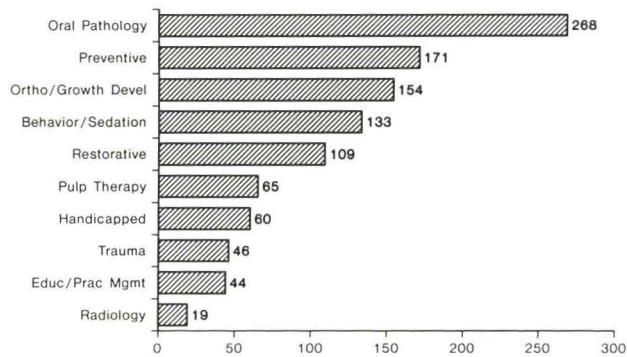


Figure 1. Articles by Topic, *J Dent Child* 1968-1988.

Of the 171 articles related to preventive dentistry, sixty-seven were on fluorides, twenty-seven on occlusal sealants, twenty-five on patient/parent education, twenty-one on diet counseling and recommendations, seventeen on caries/plaque/bacteria, eight on oral-hygiene techniques and seven on oral-hygiene devices (Figure 2).

Commercial products

There were 877 products advertised in the journal related to preventive dentistry during the study period. Dentifrices made up the largest number, 205 (23.4 percent); followed by home fluoride products, 184 (20.9 percent); brushes, 171 (19.5 percent); office fluoride products, 169 (19.3 percent); sugarless gums and sweets, 55 (6.3 percent); and occlusal sealants, 30 (3.4 percent) (Figure 3).

DISCUSSION

Significant progress has been reported in the improvement of oral health of the United States pediatric population in the past twenty years. Although many reasons for this improved health status have been suggested,

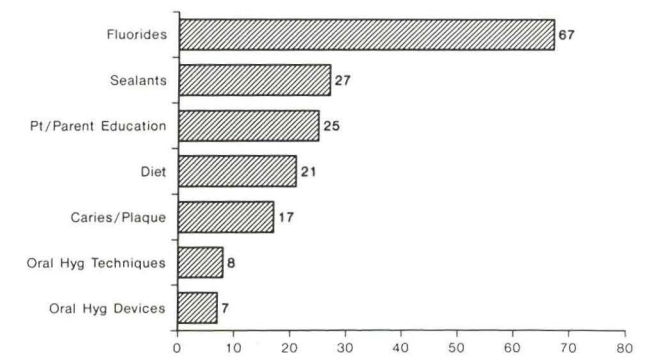
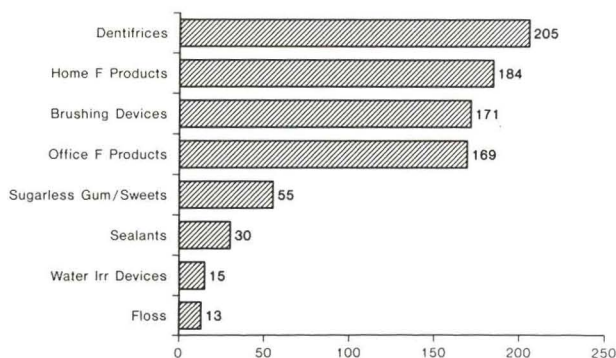


Figure 2. Preventive Dentistry Articles, *J Dent Child* 1968-1988.

most likely it is due to a combination of influences including ever-improving living conditions, a better educated parent, greater accessibility to health care, increased third-party reimbursement and the development of a variety of methods to prevent oral disease through the multiple uses of fluorides, regulation of dietary practices, removal of bacterial plaque and the placement of pit and fissure sealants.

Today, the primary preventive measures available to the public and the profession based upon the review of the literature include:

- Systemic fluorides through community water or daily supplementation.
- Topical fluorides either self-applied at home, in the school or by the dental team in the office.
- Oral hygiene practices through daily brushing and flossing.
- Dietary regulation limiting cariogenic foods.
- The placement of pit and fissure sealants on teeth at risk for caries.

Fluoride therapy, the #1 preventive measure

From all reports in the literature, it is universally agreed that the availability of the mineral fluoride, either in the systemic form or as a topical application, is responsible for the dramatic reduction in dental caries in the last twenty years.⁷ In the 1960s, less than 40 percent of the population received optimally fluoridated community water; while in 1985 approximately 62 percent of the United States population had access to optimally fluoridated water.⁸ Although supplemental fluorides in the form of tablets, vitamin combinations, and rinse-

Figure 3. Commercial Products - Preventive Dentistry, *J Dent Child* 1968-1988.

and-swallow liquids have been available for many years, only 13 percent of two- to eight-year-old children utilized this alternative to water fluoridation in 1985.⁹

There is little controversy over systemic fluoride and its effect on reducing the solubility of enamel to acids from bacterial metabolism in plaque. The major fluoride therapy changes that have taken place in the last twenty years have had to do with the dosage of fluoride (Table 1) in children under age three years who have lived in communities with suboptimally fluoridated waters; the effectiveness of stannous fluoride as compared to monofluorophosphate, and sodium fluoride in dentifrices; the desirability of stannous fluoride or acidulated phosphate fluoride for topical applications; and lastly, the use of fluorides prenatally by pregnant mothers.¹⁰ The Journal has kept its readership fully informed on all these issues, and as demonstrated earlier, the topic of fluoride made up the largest number of articles (67 or 39.2 percent) in the preventive dentistry category.

Although many of the early articles dealt with the efficacy of stannous fluoride in the form of prophylaxis pastes and topical applications, and the increased uptake of fluoride in enamel utilizing a topical gel versus a topical liquid, the issue of prenatal supplementation of sodium fluoride was by far the topic that stimulated the greatest amount of discussion and letters to the editor. The original report by Glenn (1977) was followed by eight more reports and the proceedings of a symposium held in 1981 sponsored by the American Dental Association.^{11,12} Their recommendation remains to this day controversial. It is hoped that current studies, underway in the community and laboratory, and funded by the National Institute of Dental Research, will provide additional information on the efficacy of the recommendations.

It is interesting to note that fluoride products made up the largest single source of advertising during the 1968-1988 period. A total of 558 (63.9 percent) advertisements attempted to convince the readers of the superiority of their products, either in dentifrices, professionally applied topical fluorides, or home administered tablets, gels, vitamin combinations and oral rinses. It is obvious that the manufacturers were well aware of the importance of fluoride therapy and responded with a wide variety of products containing the fluoride that was most effective as verified by research and reported in the journals.

Preventing caries in pits and fissures

Although research on the use of a plastic to prevent caries in pits and fissures was begun in the late '50s

Table 1 Changes in fluoride supplementation schedules, 1972-1986. Committee on Nutrition, American Academy of Pediatrics.

1972			1986		
Fl concentration in community water (ppm)			Fluoride concentration in community water (ppm)		
<0.5			<0.3		
>0.5			0.3-0.7		
>0.7					
Age (yr)	Mgs of fluoride supplement per day		Age (yr)	Mgs of fluoride supplement per day	
0-3	0.5	0	0-2	0.25	0
>3	1.0	0	2-3	0.50	0.25
			3-16	1.00	0.50
					0

and early '60s, it was the report by Buonocore (1970) that demonstrated that the treatment could be effective in caries control.¹³ It had been well known that the occlusal surfaces of posterior teeth continued to be susceptible to caries even in children who had been drinking fluoridated waters or receiving a fluoride supplement.

Earlier methods to reduce caries in these high-risk surfaces included prophylactic odontotomy, placing cements into the pits and fissures and silver nitrate treatments. Although studies reported some reduction in caries, the techniques were not well received. With the discovery that etching of the enamel with phosphoric acid, however, could enhance the bond of plastics, the technique of sealing the pits and fissures became a reality.

Although plastics have been improved and the etchants and etching times modified, the technique remains essentially the same. Initially, plastics were cured with an ultraviolet light source; then a system of self-polymerizing sealants became available; followed more recently by a system using white light to cure the plastic.

Many studies have reported on the superiority of one system over the other. An NIH consensus conference held in 1983 concluded that occlusal sealants were an effective and acceptable treatment for the elimination of caries on occlusal surfaces.¹⁴ Nevertheless, it was reported (1988) that only 6.4 percent of five through eight-year-olds and 11.5 percent of nine through eleven-year-olds have had sealants placed.⁹ The low utilization of this proven preventive technique continues to baffle the researchers and manufacturers. Our Journal first published a report on occlusal sealants in 1968 that reported on the reduction of caries after three years. Over the next twenty years, twenty-six reports kept the readership informed of the clinical studies as well as the changes in products and techniques for application.

During the same period only thirty advertisements were placed by manufacturers promoting the use of sealants. One wonders why the manufacturers chose

to place so few advertisements on a product that according to most reports was recognized as a very effective preventive therapy. Especially when the readership of the Journal cares for the population that would most benefit by the application of sealants.

Patient and parent education

Ever since its inception in 1927 the Society has been at the forefront in both organized and academic dentistry in promoting the oral health of children and young adults. The Journal reported on many techniques and programs that were developed by lay persons as well as health practitioners to prevent or reduce the effects of dental disease.

All would agree that the pediatric population more than any other age-segment of the population benefited most by these preventive efforts. Nevertheless, in the '50s and '60s, studies reported on high caries rates in this population.

In the late '60s a group of concerned and frustrated dentists met and organized the American Society for Preventive Dentistry, and held their first national meeting in Chicago in February, 1969. The focus of their efforts centered on the philosophy that oral disease could be prevented and that the patient/parent was responsible for their oral health and not the dental practitioners. What followed was an explosion of programs, promotions, articles, special reports, and workshops to provide the interested practitioners with the information, the tools and the support to teach patients and parents how they could be responsible for their oral health. With the Society and the Journal already deeply committed to this same cause, the leadership increased the Society's efforts and what followed was a highly successful program of educational and promotional materials for the membership. In 1970 (September-October), a wall chart for the physician's office was made available that announced that a child's physical examination was not complete without a dental examination. Also in 1970 (July-August) an editorial supported a tax on sugar and sugar-containing products.¹⁶ The proceeds of the tax would be spent on dental care for children and also support a national preventive program for children. In 1971 (September-October), an editorial promoted the development of preventive programs where the parents/patients would be responsible for their oral health.¹⁷ In 1972 the results of the ASDC preventive questionnaire sent out to all members was reported and stated that although the members were deeply committed to prevention in their offices, they were in need of a comprehensive preventive program

designed for children. The Society responded and late in 1972 the membership was issued the guidelines, *Adapting A Simple Preventive Dental Program For Children*.¹⁸ This guideline outlined in step by step fashion how a program could be developed in the private practice. These guidelines were followed by a second program in 1975 that focused on ways to motivate and sustain the preventive program once it was begun.¹⁹

In the following five years, numerous editorials and front covers continued to promote the importance of preventive dentistry programs for children. In conjunction with the editorials, a series of promotional efforts designed for the public was developed. A bold step was taken in 1979 with the production of a cartoon and radio spot announcement that recommended that the infant should be taken to the dentist at age six months or shortly after the first tooth erupted. Although this recommendation had been made earlier by a select number of practitioners, this was the first time that a national organization publicly supported the concept.

Promotional materials to be used as handouts were developed. They warned parents of the effects of prolonged nursing; answered questions commonly asked by parents on everyday oral health issues; the need for radiographs in children; the amount of sugar in cereals and frequently eaten foods; emergency procedures following trauma to the face and teeth or for a toothache; handouts on the use of sealants; development of children's teeth and interceptive orthodontics; behavior of the child in the dentist's office; preventive resin restorations; and home dental care for infants. This first audiovisual program on prenatal counseling to be used at prenatal programs was prepared and made available for distribution in the early 1980s. As a complement to the program for parents a teaching video program on the nursing caries syndrome was prepared for viewing by health practitioners.

To support these preventive measures, manufacturers placed advertisements promoting a variety of cleaning devices. It is interesting to note that of the 171 toothbrush advertisements placed between 1968 and 1988, only four promoted the mechanical brush. For a short period 1968 to 1972, the water irrigating devices were heavily promoted. Even more interesting to note that disclosing solutions were only casually promoted (5) as was dental floss (13). Throughout the period a steady promotional effort (55 supporting sugarless gums and candies) was noted.

Nevertheless, the manufacturers did not seem to place much faith in the philosophy that the patient/parent could be made responsible for their own oral health as

witnessed by the small percent promoting products that would be necessary for this effort to be effective; but rather promoted the use of fluoride products both at home and in the office (558 out of 877 advertisements).

Diet and dental disease

Miller (1890) proposed the Chemico - Parasitic Theory (acidogenic theory) to explain the etiology of dental caries.²⁰ This theory stated that acids are produced at or near the surface of the tooth by bacterial fermentation of dietary carbohydrates. The acids formed cause decalcification of the enamel and a white spot lesion is developed. When no intervention is made, cavitation is the result.

Although in theory it seems simple, designing a program to intercept the production of acid has not been successful with the majority of the population. As pointed out earlier, increasing the resistance of enamel with optimal use of fluorides has been the most successful preventive approach. Even the use of sealants on the occlusal surfaces, although shown to be very successful in controlled clinical studies, has not been widely accepted by the profession, third party agencies, and the public. Why has the profession and the public been resistant to dietary recommendations in a comprehensive attempt to reduce dental disease?

Although many theories have been suggested for the unpopularity of modifying one's diet for the prevention of disease, it is this author's opinion that what we eat, how we eat, and why we eat belongs to a very complex educational, psychosocial, and financial system that is rooted in early childhood. The most common dietary recommendations made in the last thirty years, "don't eat between meals" or "don't eat sweets" have not been successful, therefore, because of their simplicity and lack of positive rewards if followed.

The articles in the Journal over the last twenty years relating to diet and its management have been few (21). Most have been informational and reported on the amount of sucrose in a variety of foods, the role of sucrose in initiation of caries, and the effects of inappropriate infant dietary practices. Only one report (Nizel, 1972) offered a method that could be used in the office to manage the dietary practices of patients at risk for dental disease.²¹ Our editor recognizing a lack of manuscripts submitted to the Journal began a program (1978) of reprinting original articles from *Contemporary Nutrition* (General Mills Nutrition Department). Although in most cases these articles were not specific to dental disease they did provide information on basic research and clinical practice relating to nutrition and dietary management.

The Society did provide additional dietary support information to the membership in the form of patient handouts and the Guidelines (1972) as previously reported. These guidelines outlined a program on how to review a child's dietary practices, how this information could be evaluated, and a list of recommendations for parents or guardians. In the supplement to the Guidelines (1975) methods on how to motivate children in appropriate preventive practices including dietary management were provided.

Nevertheless, the role of dietary management in pediatric preventive dentistry continues to be a mystery understood by few and practiced by even fewer. With the increased enthusiasm nationally to monitor and modify our diets for the purpose of a healthier cardiovascular system as well as the research demonstrating the preventive role of various food-stuffs and the effects of chewing gum after snacks and meals, there is hope that there will be an increased effort to develop acceptable methods to reduce dental disease by dietary management.

CONCLUSIONS

The Journal has been a powerful voice in the last twenty years by providing its readership with articles pertinent to the assessment, diagnosis, and treatment of oral disease in pediatric patients. This segment of our population is enjoying the best oral health ever experienced in the United States. Although many theories can support the reason for this success, most likely it is attributable to many factors.

The concept of preventing dental disease, instead of treating its effects, surfaced in 1960s, was further refined in the 1970s, and has become a household word in the 1980s. Although the profession has been assisted by many educational programs, the dental journals have been an important vehicle for the dissemination of information. *The Journal of Dentistry for Children* and George Teuscher, its editor, can be proud to have been part of this educational movement directed to the oral health of infants, children, and young adults.

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HOME CARE

With the changes in the child's knowledge base, socialization, and maturation during this period (three to six years), it would appear that daily home care should become less difficult. Unfortunately, that usually is not the case. Parents tend to assume that children can be more independent than they actually are able to be. Parents also assume too early that their child's motor coordination has progressed to the point at which manipulation of the brush and floss is within reach. Meanwhile, children increasingly want independence. They like to go to the bathroom themselves; they don't need help from Mom and Dad.

A negotiated settlement has to be reached. For example, after meals children can *brush* their teeth with minimal, if any, supervision. At bedtime, the parents will *clean* the teeth and massage the gums. Parents and children working together as a team, each with their identified responsibilities, can help to develop a program of success that can be further monitored and modified by the dentist.

During this period, all the primary teeth should be present. Spaces that were visible earlier may begin to close. Cleaning of the mouth includes brushing the teeth and cleaning the areas of the tooth where the gingivae touch the teeth. This is a fine motor activity, which most 3- to 6-year-olds cannot completely perform without assistance. In addition, the lingual surfaces of the mandibular posterior teeth and the buccal surfaces of the maxillary posterior teeth are the most difficult to reach and to see whether all the plaque has been removed.

As spaces close, the use of dental floss is indicated. Generally, three- to six-year-olds will be unable to floss. Parents will be responsible for this activity. A commercially available floss holder will greatly assist. Care should be taken not to snap the floss into the interproximal gingiva, causing injury.

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Behavioral themes in dentistry for children: 1968-1990

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A*ll is flux, nothing is stationary. There is nothing permanent except change.*"

—Heraclitus, Greek philosopher, c. 540–c. 470 B.C.

TWENTY YEARS AGO

It seems reasonable to conclude that, when Dr. Teuscher became editor of the *Journal of Dentistry for Children* at the junction of the '60s with the '70s, in the field of the behavior management of the child patient, particularly the normal child after his third birthday, dentistry knew what it was doing. There were articles on techniques of behavioral management, chapters devoted to behavior management in textbooks, the specialty of pediatric dentistry, a strong Society of Dentistry for Children, and many pediatric dental faculty who understood and were capable of teaching techniques of behavioral management to dental students. Successful generalists and specialists in this area could be identified in virtually every community large enough to have dental offices.

The fact that dentists could learn to manage children during the dental experience was noteworthy because the entire success of the movement to provide dental care for children in the United States was predicated upon realizing such an accomplishment. This was particularly true for the younger children, especially ages three to six. In fact, the traditional age of a child's first dental appointment being somewhere between the third and fourth birthdays was certainly based upon the child's behavior and the dentist's ability to control it more than on any other consideration. The hallmark of thirty-

six months of social, psychological, cognitive, and emotional development paired with the finding of a complete primary dentition with or at substantial risk to dental decay was the determinant of appropriate timing of the initial appointment in the preprevention era of children's dentistry.

The successful interfacing of dentists with children was accomplished by time-tested techniques that were taught in dental schools and modeled by dental faculty. A typical dental school education stressed the tell-show-do technique, in which the new things and events of the dental appointment were explained and demonstrated to the child, in order to reduce any attendant threat. Most students would understand just how deliberately a clinician needed to talk to a little child, in order to secure his confidence. Students understood that anything mysterious in the appointment could provoke the child to anxiety.

The importance of a good first experience, a nice introductory appointment, was certainly heralded as beneficial to all involved, including an anxious parent. Child-centered communication, friendly talk—"child-ese"—questions about Christmas, birthdays, Easter eggs and Saturday cartoons; a friendly waiting room with books and toys to which a child could relate; and praising everything that one could about a child's cooperation were all parts of a good fifty-minute sophomore lecture on how to get along with children, during the dental experience.

Of course, just about every school talked about assertive/aversive techniques also. There was voice control, which meant that, if the dentist gets determined

about securing a child's compliance to the expectations of the appointment and can convey that determination by spoken words and gestures, the child will sense this importance and do as instructed. The hand-over-mouth technique was talked about as a way of preventing or controlling hysteria. Physical restraint of children inevitably was discussed in the classroom and demonstrated sometime later by a faculty member, in the clinic.

So, was there a "party line" in child-patient management back then? Had dentistry learned how to treat children with techniques so universally accepted that they were found in virtually all pediatric dental textbooks of the day and in the lectures of the majority of pediatric dental departments in the country? The answers to these questions can only be given in the affirmative. There was widespread acceptance of the fact that the management of children by a dentist was something on which one could rely. Successful management of some children was easily accomplished, while with others aggression was required. Child-patient management was, for the most part, a very personal thing between the dentist and the child. Mother's help was usually not needed nor was it wanted. Little signs in the waiting room to remind her that she was not needed during this very special occasion were on display in dental offices across the country. There was very little legal risk in treating children dentally and, therefore, very little litigation in this area of dentistry. There just was not much ado or debate about dentists and the management of their child patients back home.

In fact, Wright in his 1975 text, which was devoted solely to the management of children's behavior, in reflection upon nonpharmacotherapeutic techniques, makes the following observations, "The topics are not revolutionary. Rather they have been evolutionary. For the most part, the techniques have been developed by generations of dental practitioners and they form the backbone of child management in dentistry."¹ The words "generations" and "backbone" underscore how satisfied the profession was with its child-management techniques.

It is important, however, in assessing what has happened over the last twenty years to say that the "party line" regarding child-patient management was not a 100 percent phenomenon. In the late '60s and early '70s, there were other techniques that might be emphasized by a particular faculty and practiced by certain clinicians. Certainly nitrous oxide/oxygen was enjoying at that time a lot of attention from the profession; and the utilization of this technique for management of pediatric patients was contended by many to be an improvement over many other methods. Reducing maternal anxiety, time out, hypnosis, observation

appointments, medications, and even audio analgesia were some of the other methods that might be addressed by a particular teacher/clinician.

In fact, there were those who enjoyed nitrous oxide/oxygen so much that they used it on virtually every child. Such practitioners might almost categorically reject ever using any assertive methods. There were pre-medication-oriented practices that routinely sedated younger children when anything that might provoke anxiety was done. There were some dentists who felt considerable tensions about their own use of assertive/aversive techniques with children, despite what they had read and been taught.

By the late '60s and early '70s, as Chambers concluded, there was "an embarrassment of riches" available to the profession to help manage the child patient.² Many of these methods, however, were not as universally addressed in dental academe and the existing literature as were tell-show-do, voice control, and even hand-over-mouth and physical restraint.

Except for a 1971 survey of the members of the American Association Pedodontic Diplomates (120 responses were tabulated), the number or percent of dentists, twenty years ago, who accepted the traditional inventory of child management techniques without questioning it, and the number and percent of those who had substantial doubts about aspects of that inventory were apparently not studied in any detail at a national level.³ There was probably a wide variation from one area to another, depending upon such facts as from what programs various dentists received their educations, where they grew up, where they practiced, and their personal dental experiences as children and the convictions they carried away from those experiences. Certainly many issues could influence a particular dentist's personal convictions about the appropriate way to manage children. No matter what the differences were from dentist to dentist, however, they were not as dramatic as today, nor as important. A lot happened in this area of dentistry for children over the last twenty years.

WINDS OF CHANGE: A PERSPECTIVE ON THE LAST TWENTY YEARS

In the last twenty years, the realities of life and living in the United States have changed dramatically. All aspects of society have been affected. Popular publications anticipated these changes and tried to explain their causes.⁴⁻⁷ In fact, twenty years ago we were told in one very popular publication that the changes would "shock" us.⁴

The following is a list of issues, findings, facts, and

themes whose concern for and influence on American children have grown substantially and more serious in those twenty years: Drugs, poverty, eating disorders, delinquency, arrests for crime, runaways, dysfunctional coping mechanisms, litigation, truancy, illiteracy, MBD, early detection of TMJ problems, latchkey existence, sexually transmitted diseases, homelessness, child abuse, refractory behaviors, divorce, unmanageability, fetal alcohol syndrome, anabolic steroids, gang activity, wilding, and cult worship.

This list could easily be expanded. It can tax the imagination to understand all the new awarenesses of

being an American child today, compared with twenty years ago. Changes in the realities facing an American child have been fast and dramatic, since the late 1960s.

The behavioral aspects of pediatric dentistry have not been immune to change, during these times. The fact that American dentistry had found success and contentment in managing American children before 1968 did not mean that this area of dentistry for children would not, or did not need to change. It is now clear that change was inevitable for many social and behavioral realities of the late '60s and early '70s and that the behavior management of children by dentists has been

TRENDS AND REALITIES

The *Journal of Dentistry for Children* has, since Dr. Teuscher's introduction as Senior Editor of the *Journal* in 1968, addressed the behavioral realities of a dentist interfacing with a child. The *Journal's* focus on this area of dentistry for children has been consistent and frequent. The topics that have been covered represent a wide range of themes. There have been clinical opinion papers and research papers as well as combinations of the two, essays and editorials, pro's and anti's, how's and why's etc. In reviewing these papers it becomes obvious that the interface of the dentist with the child has remained a serious issue and that behavior management is indeed as fundamental to the successful treatment of dentally diseased children as are handpiece skills and knowledge of dental materials.

What has been the magnitude of effort of the *Journal of Dentistry for Children* under Dr. Teuscher's editorship in this area? In other words, how many entries have there been in the *Journal* that focus on this topic area called behavior/dentistry/children during his tenure as editor?

The simple answer is that it has been substantial. To get more specific, how-

ever, requires some definition of what one is looking for. Starting with the January-February 1968 issue (Dr. Teuscher's first as editor) and ending with the July-August 1989 issue, a total of 130 issues altogether, a review was conducted to determine the actual number of issues that contained behaviorally related information and the actual number of such articles. In order to conduct this inventory, some rules were followed from the onset. To be included in the general area of behavior would be the following topics:

- Obvious behavior management techniques and/or papers on the psychology of childhood.
- Child abuse and neglect, if any psychological ramifications of either the abused child or the abusing adult were discussed.
- Premedication for patient management, if child behavior as an indication for the technique was discussed or the effects on behavior were described and/or measured.
- Studies of the physiological aspects of anxiety of the child patient.

- Habit therapy, if a specific psychological/behavior modification technique was described.
- Injection techniques, if the behavior management of a child was specifically addressed in the paper.
- Miscellaneous: such topics as eating disorders, adolescent pregnancy, suicide, etc., if psychological issues were addressed in the paper.

The following topics were omitted from this inventory:

- Oral hygiene motivation and motivation techniques.
- General anesthetic management of children, if only treatment data, technique, risk, etc. were discussed.
- Health education and related topics.
- Socioeconomic descriptions of child populations, unless a behavioral issue was specifically addressed in the paper.
- Syndromes, case reports, etc, even though certain conditions, e.g. Tourette's, obviously have behavioral overtones.

measurably affected, at least in parts of the United States.

So, how dentists will, can, and do manage their child patients has changed over the past twenty years. In fact, unquestionably, there will be more change in the next twenty years. Understanding the past may illuminate present and future realities in this area. It can provide answers as to why there is not disagreement between some dentists and some parents, even between dentists, about what constitutes good child-patient management; why risk management in this area has become a popular continuing education theme; why consent before managing a child with hand-over-mouth;

why the American Academy of Pediatric Dentistry felt a need for a national conference/workshop in this area (Iowa City, 1988); why many other such findings dramatize the fact that this area of dentistry for children is under inspection by not only the profession, but by society in general.

To explain the whys and hows of this change may best be accomplished by looking at dentistry's adjustment to new parental/societal expectations of appropriate management of their children by any authoritative adult. It would seem that in the late '60s and early '70s there was not as much thought given to how designated

OF BEHAVIOR MANAGEMENT

This inventory shows that in the 130 issues from 1968 to mid-1989 that at least eighty-two issues (63 percent) presented one or more articles addressing the behavior of children according to criteria above. A total of approximately 130 articles over this 21.5-year period have been covered by the *Journal*. This is a substantial amount of literature dealing with something that could have been argued as nearly "signed, sealed, and delivered" in 1968 by some.

It is also easy, therefore, to conclude in reviewing the past twenty years of *Journal of Dentistry for Children* that Dr. Teuscher and his editorial staff as well as the contributing authors have felt that the *Journal* would be enriched by the publication of behaviorally oriented articles. They have seen such publications as being a responsibility of the *Journal* to the profession and the children the profession treats. Indeed, Dr. Teuscher's own words from a 1973 editorial reflect his own reasons for a continuing focus in this area.

"Our current concern with the behavior of the child dental patient is of high magnitude because the majority of

dentists desires to build into its patient relationships a generous portion of quality. If this were not the case, the Machiavellian doctrine that the end justifies the means would constitute the quintessence of morality and success. That majority, however, recognizes the fact that problems of health involve ultimate issues of an ethical and moral nature."¹

It would be foolish in an overview paper to even list all of the behaviorally oriented publications in the *Journal of Dentistry for Children* over the past twenty years. Such a task would accomplish very little. Suffice it to say that there have been many good ones. They would seem to fall in the following categories:

- Research on the efficacy of a behavioral technique.
- Sophisticating dentistry's understanding of a technique (often using language borrowed from psychology or other sociobehavioral sciences to explain new insights and explanations of how certain techniques work).
- Research about and/or essay on the appropriateness or lack of appropriateness of a certain technique(s).

- Descriptions of special children and their management problems.
- Descriptions of pharmacologic management of behavior.
- Discussion of socioparental issues.

When all of the *Journal's* behavioral literature of the past twenty-two years is looked at, the following conclusions about child behavior management seem reasonable:

- Effective child-patient management was a concern twenty years ago and still is today.
- There are many methods available.
- No perfect, 100 percent reliable method has been described. (And, there never will be one.)
- Some methods are considered by some dentists to be controversial.
- Both opinion and science have been influential in fashioning present trends, realities, and understandings in this area.

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authoritative adults handled children. This applied to school teachers, athletic coaches, camp directors, and physicians, and to dentists too. Certainly there was not the threat of litigation about questionable management that exists in parts of the country today. It would appear that dentists and parents often were of one opinion about child behavior in the dental office and that such a commonly held opinion allowed dentists to manage children as they were taught to do in dental school, as it was discussed in their pediatric dental textbooks, and as it had been explained in papers in the *Journal of Dentistry for Children* and other periodicals.

Twenty years ago, the appropriateness of the child management techniques used by dentists did to a large measure, therefore, rest upon the convictions of the parents who trafficked their children to dental offices. Even the more assertive/aversive techniques were not questioned very often. Furthermore, when applied, they probably worked just as they were described by the dentist's teachers during his training. An occasional doubtful or suspicious parent had little impact on the dentist's personal convictions about these useful, effective, and widely accepted management techniques.

On the other hand, if numerous parents were not so sure about the appropriateness of the management techniques, insecurities might arise within the practicing dentist. At some point, when a substantial number of the parents of the community are adamant that certain techniques are inappropriate, the dentist out of common sense and for the economic survival of his practice may need to relent on their use. In certain communities, this happened. The dentists changed their approach to managing children. Sometimes this change was rapid. This could lead to the finding that certain techniques, acceptable for use with the first born of a given family, might ten years later be unacceptable for the younger sibling.

Did something like this really happen in the United States over the last two decades? It has happened at least in parts of this country and seems to be continuing today. The change in parental attitude toward the management of their children by other adults has been well described in a text intended for pediatricians by Shulman and Hanley as a phenomenon of paradigm-shifting.⁸ A paradigm is a set of beliefs held to be true and important.⁹ Paradigm-shifting does not by definition mean that the new set of values is better than the old set, although human nature and ego encourage us to believe we are always making things better. Great arguments arise in groups of people when only a fraction of the original group makes a paradigm-shift. To some degree that has happened in the past twenty years in

dentistry for children, and today there are practitioners allegiant to a traditional ledger of nonpharmacotherapeutic management techniques, another group allegiant to frequent use of pharmacotherapeutic techniques, another group allegiant to greater involvement of the parents in the dental appointment, and finally, even a group who for a variety of reasons would rather not treat children at all. The "party line" at the very least has been questioned and in some instances, substantially modified.

It has also been pointed out that paradigm-shifting around any issue usually begins with educated people who are confident enough to resist prevailing assumptions. They are people who have broken from traditional values, because they have the self-confidence to act independently. A consummate generalization about paradigm-shifting is that in the beginning, the suburbs would experience changes before the rural township, the city before the county, the college-educated before the only high-school educated, the moving before the stationary, the white-collar worker before the blue-collar worker, and southern California before southern Iowa. As regards dentistry for children and parents who sought new expectations, therefore, for the management of their children, the first affected practitioners would be those in urban/suburban locales that were attracting educated, upwardly mobile parents.

As these highly employable and therefore mobile parents move away from the communities that reared them, another phenomenon also takes part. This phenomenon has been described as a shift in the three possible ways that a society (or part of a society) can implement a strategy to rear its children. These ways as described by Margaret Mead are postfigurative, con-figurative and prefigurative.¹⁰

Basically, in very general terms a postfigurative society rears children the way they have always been reared. Little boys get circumcised, because little boys always get circumcised. Little girls are available for courtship at a certain age (and not before), because that has always been the age that little girls could become available for courtship. Little boys get a paper route and start mowing grass at a certain age and little girls start doing dishes or are expected to learn how to cook at a certain age, because that is when it was always done. In a postfigurative society, there is very little head scratching by the parents. If the parents are not totally sure of when and how things should be done, then the larger family, which is usually wrapped around their lives (since they have not moved away from where they were reared), will remind them. Such families are common place in rural areas and some stable urban

areas. Many Americans who were reared before World War II were reared according to this strategy.

A configurational process of rearing children (again, in very general terms) means that the parents will do it as they remembered it done for themselves, with modifications as they see fit. Configuration looks at the immediate past and the present to aid in devising a strategy. Such parents usually do not live any longer around a community or family who deliberately guide or coach them as to how they should parent their children. Such parents have often moved away from their hometown (perhaps home state). Their children often are in day-care circumstances, and the grandparents are only visited at major holidays, if at all. This could be a rural event, but for the most part, this is an urban, suburban phenomenon. In a highly mobile society, such as the United States has increasingly become since World War II, there obviously can be a lot of children reared in a configurative process. There is some head scratching with configurative parenting, because if a certain dilemma occurs (Joey was caught stealing today) the parents, if they did not like the way they were reared through such a crisis (or never experienced it), have the challenge of suggesting something they perceived as better or more effective. In such cases, the past does not provide a useful reference and they must use realities of the present to determine what to do.

The last parenting strategy, prefigurative, means that the parents will solve each of the dilemmas of rearing their child, on a day-by-day basis. According to Mead, the parents are actually learning from their children.¹⁰ There can be a great number of questions and anxieties associated with this strategy. That is not to say that it is not an effective process for our days and times, perhaps even a natural process. The following scenario, however, could be true. The child reared by a postfigurative parent would take his cod liver oil during the cold season, because children always take cod liver oil during the cold season. A configurative parent, on the other hand, may or may not make his child take cod liver oil. It depends in part on his own remembrances of the experience of taking cod liver oil and on present perceptions of how beneficial it will be. The prefigurative parent must determine the pros and cons of taking cod liver oil versus the chances of acceptance of nonacceptance by his child. This parent will look to the child for feedback. The answer could vary from day to day and the parents may hold opposite views. Lastly, the perception of a wrong decision by the prefigurative parent(s) may promote feelings of guilt, an experience the postfigurative and configurative parent may be spared.

The example could be made that postfigurative parents will expect their three-year-old to go through the dental appointment behaving well and do so without parent accompaniment, because that was always the way it has been done. Configurative parents may opt to do it that way, because that was the way it was done for them, and it worked out just fine, or they may have a strong desire to accompany their young child, because they remember it did not go so well for them during their first appointments. They will pair their own remembrances with present convictions. The prefigurative parent must solve this one before arriving at the dental office. Likely, if the child looks anxious, they will want to stay with the child. That is not an absolute assumption, but experience supports it.

Both of these social processes, paradigm-shifting and change in parenting strategies, have been manifesting themselves for a long time in our society. It is important to note, however, that they were almost imperceptible before World War II in most of the country and quite frankly in the '50s and early '60s they were not critical issues for a lot of the country as well, save for some earlier, well-educated parents who foreshadowed these movements. It would seem that the real momentum in these changes came toward the late '60s at about the same time the *Journal of Dentistry for Children* came under the aegis of Dr. George Teuscher. Dr. Teuscher and the *Journal* have been audience to the explosions of a diversity of opinions about the best way for children to interface with their dentists that have predicted today's realities.

Dr. Jerome Kagan, Head of Development Psychology at Harvard, notes in the preface of his book *The nature of the child* that one thing that has hampered a satisfactory explanation of the development of the human psyche is that "most observers of children begin their work with a deeply held personal philosophy about what human nature is or should be, and how it attains its adult form. These philosophies are influenced by the politics, the economy, and the social structure of the society in which the observer lives."¹¹

Certainly this observation of preconception is at least somewhat true of peoples', parents', and dentists' convictions about dentists interfacing with children. This is an area very prone to opinions and opinions are subject to change. Twenty years ago, dentistry offered a simpler, more uniform strategy for interfacing dentists with children, and dental students and parents accepted it, for the most part. There was not so much possible disparity between the personal philosophies of dentists with parents, or even among dentists, about how children could and should be guided through the



expectations of a dental appointment. Simply put, back then we may have been mostly postfigurative folk who were allegiant to the paradigm of the appropriateness of nonparental authorities interfacing with our children with determination. Our preconception was that children should behave or should be made to behave, during the dental experience.

Today the issue is that there is disagreement, sometimes very substantial disagreement, among adults as to how an authoritative adult should manage children. This affects dentists, physicians, nurses, day care workers, teachers, the law, relatives, and even parents themselves. This disagreement is to be expected, when a significant part of society believes with keen conviction that there is a new way, a better way, a different way that they feel is correct, right, and beneficial for children. The profession today witnesses a need to understand these new realities presented by prefigurative advocates and by those who do not endorse the imposition of overt authority upon their children by such people as dentists.

It is important that dentists not allow their "deeply held personal philosophy" about how best to manage children to make them objectionable critics of colleagues who quite simply believe differently. This is not an issue of rightness and wrongness in a scientific sense. It is opinion and personal philosophy.

Along this line of thinking, Shulman and Hanley have this sage urging to their pediatric medical colleagues, "These are time-honored phases in family and individual lives. The question is this: How does one raise children in the midst of a major paradigm-shift in the entire culture? There is no easy answer, and parents may benefit from knowing that they are not alone in this quandary. Experts cannot predict future outcomes. Everyone is navigating without charts, wanting to sail boldly on but fumbling about afraid of concealed rocks and unsure of the course ahead. One should be skeptical of those who have great certainty about future directions."⁸ To stay open-minded was a recurrent theme in the 1988 Behavior Management for the Pediatric Dentistry Patient Conference in Iowa City.¹² It is the only reasonable approach.

When there is disagreement, there is the chance for a quarrel. When there is disagreement, there is the chance in our society of litigation. Today's dentist who treats children is urged to recognize this last fact and to practice behavior management with caution, with informed consent when needed, and with complete conviction that more change—what and which way I do not know—is inevitable for "there is nothing permanent except change."

IN SUMMARY

Although the dentitions of children presented special circumstances to be intellectually reacted to by the profession of dentistry, such as eruption and exfoliation, changes with growth, different pulpal treatments, etc., none of these issues was as pivotal to a successful dentistry-for-children movement in the United States as was the ability of dentists to guide and manage the behavior of children through the dental appointment.

The fact that dentistry was able to develop a ledger of techniques that would successfully help a dentist to interface with the child patient is important and would warrant any journal dealing with dentistry for children to seek continual refinement, reexploration and redocumentation of the profession's success in that area. The fact that some dentists actually enjoy their child patients would encourage such a journal to keep this motivation fresh and in perspective by timely presentations of scholarship in this subject area.

The *Journal of Dentistry for Children* during the Teuscher years certainly has upheld its commitment in the area of the behavioral sciences in dentistry for children. Approximately 130 articles dealing with a variety of behavioral topics have been published during Dr. Teuscher's editorship. In fact, had it not been for the

Journal, the most substantial contributions in this area that have been offered in the English-speaking literature over the last twenty years would have either sought sponsorship by other journals or just would not have been there for the profession to read. To some degree, the existence of the *Journal of Dentistry for Children* for the last twenty years has served as a beacon to those young authors, researchers, and clinicians who knew, if they could germinate an idea into meaningful literature, that they might find a publication receptive to their enthusiasm and an audience that would share their interest in this area.

What are the meanings of such a substantial aggregation of dentistry for children/behavioral papers? One has to be that the readership of the *Journal*, as detected by Dr. Teuscher, the editorial staff and the contributing authors, was still interested in the subject. Second, it would show that there has been and still exists intellectual curiosity, as to what is going on in this area of dentistry for children. Third, it could be argued that dentists and behaviorists continue to delve into this area, because there still must be controversy about this. This may be due to the fact that there has not been a consensus on certain issues in the behavioral management of children by dentists over the past two decades. This last fact may be because of society's rapid changes regarding children and their nonparental management.

Lastly, it probably means that dentistry for children is very much a changing behavioral activity and that any journal addressing this activity must by definition continually address this subject and its changes.

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ULTRAVIOLET LIGHT AND DENTAL CARIES

Because children were preselected by the local school board and head teachers as to which school they attended and to which classroom they were allocated, socioeconomic status and academic ability did not influence the selection of classrooms having 'full spectrum' lighting. Furthermore, all children in grade 5 were involved in the study, the age ranges of children in the experimental and control groups were almost identical. The baseline caries examinations showed children in the experimental group to have a higher past-caries experience and marginally better oral hygiene and gingivitis scores. When 'caries 1' (sticky fissures) were included in the analysis, the incidence of dental caries over the 22-month period showed many reversals for the children with the ultraviolet light in their classrooms. When caries 1 findings were excluded and caries 2 and 3 criteria only were analysed, the incidence of new lesions was significantly lower ($p < 0.001$) for the children receiving the additional ultraviolet light. These findings demonstrate both reduction in new lesions and reversal of 'caries 1' lesions over the 22-month trial period for the children receiving the ultraviolet light radiation.

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Dentofacial growth and development

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This paper addresses changes that occurred during the last twenty years related to "dentofacial growth and development" that, in our opinion, were noteworthy because they changed the way those involved thought, practiced, or investigated. Theoretical growth and development as well as its practical aspects are explored. Diagnostic and treatment methods, where technical innovations are most apparent, are considered in the context of classical orthodontic thinking. In some instances conclusions are drawn; in others, comments are made on the future.

GROWTH AND DEVELOPMENT

Theoretical issues

Before 1960 many investigators and clinicians believed that dentofacial growth and development was dictated totally by genetics.¹ Occasionally, today, we adopt this position when we attempt to disguise treatment failures as the result of unfavorable growth. Sometimes this is justified, sometimes not.

The primacy of the sutures and cartilage as prime movers in skeletal growth was questioned during the 1960s.^{2,3} The questioning was sharpened by Moss with introduction of the "functional matrix" theory.⁴ Moss's original position was that the skeletal tissues were totally reflective of other functional components and spaces of the face (e.g. the airway, eye or muscles of mastication). Throughout the last two decades a moderation of both the genetic and functional philosophies occurred. Mainstream thought today acknowledges both

genetic and environmental influences. These changes occurred as the result of interpretation of pathologic specimens, tissue transplantation studies, experimental and therapeutic surgical resection, and investigations in genetics.^{1,5-8}

The mandibular condyle along with the flat bones of the cranium and face and alveolar bone are readily influenced by functional and environmental factors, which makes them appropriate targets for therapeutic intervention. The nasal septum demonstrates more genetic potential, but could serve, in part, as a support with predominantly biomechanical implications. The orientation and position of the cranial base can affect facial morphology and may be less susceptible to change than other structures, but not beyond influence.

Lundstrom estimated that 40 percent of the variation in malocclusion was attributable to hereditary factors.⁹ Obviously adopting a perspective in which growth of the dentofacial region can be influenced justifies treatment in an effort to reduce development of malocclusion. Having come to this middle ground of "epigenetics", which acknowledges both heredity and environment, we must remember that all tissues may not be influenced similarly, by the same factors, to the same degree, or at the same time. Although some progress has been made, basic issues of control of facial growth, tooth eruption, and the interaction of facial and dental growth await detailed descriptions.

An excellent example of the problem of assigning the responsibility for facial form between genetics and function is demonstrated by the "airway controversy". For years it has been unclear whether or not, and if

so, how respiration influences the patient's dentofacial type. Are long-face patients born with a genetic predisposition to their facial features, or is this an environmental phenomenon?

Observers listed characteristics that denoted the "adenoid face" and associated it with mouthbreathing.¹⁰ Subsequently, researchers used quasiscientific methods such as cold mirrors and cotton wisps held beneath the nostrils to detect nasal respiration.^{11,12}

Later researchers used lateral cephalometric headfilms and nasal resistance to quantify both airway size and respiration.^{13,14} It became apparent that the two-dimensional radiograph was inadequate for assessment of the three-dimensional airway, and that at high levels of nasal resistance some mouthbreathing was evident.^{15,16}

Several other findings began to emerge in the 1980s as investigators were able to quantify reliably both nasal and oral respiration. From these investigations it became clear that: lip incompetence was not synonymous with mouth breathing; oral/nasal respiration ratios vary between patients and within facial types; facial patterns are difficult to correlate with concurrent respiratory patterns; nasal airway dimensions increase with age; children develop as more predominantly nasal breathers with age; and adequate nasal airway dimensions do not guarantee nasal respiration.^{17,21} Some of these results appear to be paradoxical, while others are expected. The resolution of the airway dilemma and the clarification of the functional paradigm remain to be elaborated.

Growth prediction

Growth is important in every orthodontic case; its presence or absence can greatly influence the treatment plan. This is particularly true for the adolescent patient who is approaching the end of active growth, but still has a significant skeletal malocclusion. Using knowledge of the principles of growth and development and the tools of modern science, the practitioner must make the best estimate of the patient's growth potential and generate a treatment plan.²²

Growth prediction is not as simple as it appears. Simply adding an amount of growth representing a "mean change" determined from a similar group of patients is unlikely to produce an accurate individual growth prediction. In order to predict facial growth accurately, one must estimate both the future size of each facial component and their probable relationships to each other. Additionally, one must know the growth velocity and direction during the period. Unfortunately

these are often totally independent variables, that behave in an unpredictable manner. When you factor in the effect of the orthodontic treatment, the complexity of the problem of growth prediction becomes obvious.²³

The first attempts at both manual and computerized growth prediction occurred in the early 1970s. With the manual methods, mean growth increments were added by direct superimposition on a printed grid that located key landmarks. These techniques used the patient's chronological rather than skeletal age as a starting point and assumed a relative degree of constancy in the pattern of facial growth.²⁴

Another approach was advocated by Ricketts, who used the principle of arcial growth of the mandible to develop both manual and computerized prediction techniques.²⁵ His technique, which assumes that growth continues along the established mandibular arcial vector, is the basis for the Rocky Mountain Data Systems commercial prediction service.²⁶ Early studies found this method to be an improvement over manual forecasting techniques, because it recognized unusual facial patterns in its prediction scheme.²⁷ A more recent evaluation of this approach revealed variable success, because the computer was quite accurate at predicting certain components of facial growth, such as maxillary position and the location of the incisors; but less accurate at assessing mandibular location and the future soft tissue profile.²⁸ Since this study was completed, Rocky Mountain Data Systems changed from a punch card system that used small samples as the data base for predictions to a fully automated system. This may result in more reliable forecasts, but no data are available on the accuracy of this new system.

Many programs are available for the personal computer that incorporate growth prediction as part of the orthodontic package. It is assumed that these are based on some of the samples of untreated patients available at several growth centers; their accuracy, however, has not been scientifically validated. Accurate growth prediction, in any form, for that unique patient in your chair remains elusive.

Postadolescent growth

Considerable research effort in recent years led to a more complete understanding of the timing and extent of postadolescent growth. The old concept that growth ended with the adolescent growth spurt was replaced by one that recognized continued but differential growth of various components of the face well into middle age.²⁹

The so-called "late mandibular growth spurt" is caused

by a forward rotation of the mandible that occurs after adolescence. This phenomenon is not due to an increase in mandibular growth. In fact the rate of mandibular growth actually decreases during this period. Instead, the maxilla stops growing, particularly in the vertical direction, one to two years before the mandible, which allows all the remaining mandibular growth to be expressed in a forward direction.³⁰

The late mandibular growth spurt should not be confused with the continued forward mandibular growth often seen in Class III patients who have true mandibular prognathism. Despite enhanced imaging techniques, we still have little idea how to predict the extent and nature of future mandibular growth in those cases.³¹ Current clinical practice requires waiting until superimposed lateral cephalograms show no growth occurring over a period of at least one year, or until the patient demands treatment for psychosocial reasons; and then attempting treatment with orthodontics either alone or in combination with orthognathic surgery.

With the ever-increasing number of adult patients seeking orthodontic care, it is important to understand facial growth that occurs into the third and fourth decades of life. Most of our knowledge in this area is attributable to the longitudinal analyses of Behrents, who chronicled craniofacial development in adulthood.³² His studies revealed considerable continued postadolescent growth that produced changes ranging from 2 percent to 10 percent in the total size of the facial skeleton. These changes were found primarily in the vertical direction and led to lengthening of the face. Concurrently there was a flattening of the facial profile caused by more nasal growth and prominence; flatter, thinner lips; more upright and less prominent incisors; and increased soft tissue at the chin point.³¹

The potential consequences of these facial changes are considerable. First, they call into question the accuracy of growth predictions that assume termination of growth during adolescence and suggest that many of our cephalometric adult norms, which are based on samples of eighteen-year-olds, may not be applicable to patients in their thirties and forties.

Behrents' findings may partially explain the relapse problems seen in orthodontic cases, although to date there are no published data to validate this hypothesis.^{33,34} If validated, the implication may be that, as well as providing dental retention, we should continue with some form of skeletal retention (i.e. headgear or functional appliance) for a considerable period. Continued facial growth may also play a part in some of the long-term changes currently found in posttreatment orthognathic surgery cases. Long-term growth and facial

changes need to be considered in the treatment planning process.

DIAGNOSIS AND TREATMENT PLANNING

It is important to recognize that the concept of normality can change. Constant vigilance is required to be certain that one is in tune with the current standard. Treatment goals may not be as concrete as imagined. As noted above, continued growth of the face during the third and fourth decade makes the perceived endpoint of orthodontics at the time of debanding or during the early retention years, either impractical or naive.

Imaging and analysis

Because the profession and consumers now are more radiation conscious, new guidelines aimed at reducing radiation exposure, including assessment of growth and development, were developed.³⁵ These guidelines allow for individualized radiographic examinations in children and assessment of the adolescent for the presence of third molars. Present data indicate that little occult pathology is discovered in children from screening panoramic radiographs exposed in the absence of positive historical or clinical findings.^{36,37} Multiple panoramic radiographs, with the exception of the truncated "third molar" panoramic radiograph, provide little new information.³⁸

Clinical assessment is critical to the diagnosis and treatment planning of orthodontic patients; but it is often viewed as secondary, after the cephalometric analysis, because of its subjective nature. Some data indicate that changes during the course of treatment are more critical to treatment success than the original treatment plan.³⁹ Cephalometrics has led to numerous advances in dentofacial biology and remains essential for many aspects of research and treatment. Still, unjustifiable comfort is gained by believing that one can capture the essence of the abnormality that led to the malocclusion from amongst the numbers generated by a cephalometric analysis. It is unlikely that cephalometric analyses influence all treatment plans equally, but the effective marriage of clinical evaluation and diagnostic techniques is yet to be realized.

The conventional approach to cephalometric analysis is based on measurement of a patient's structures in angular and linear terms. These values, compared to group data, are the essence of current analysis. The proliferation of personal computers and automated cephalometric evaluation perpetuated this numeric approach. Steiner noted that numerous compromises in

tooth relationships are possible in achieving a satisfactory occlusion.⁴⁰ Diagnosis "by the numbers" can be misleading. For example, Class II skeletal relationships that can and should be modified in the growing child may be tolerable relationships to camouflage with simple orthodontics in an adult female where a weaker chin can be accepted, but grounds to consider surgery in an adult male. Advances in technology will perpetuate data, but not understanding and knowledge.

Moyers and Bookstein illustrated problems with conventional cephalometrics.⁴¹ They commented that the theoretical basis for cephalometric representation is ill-defined. Discrete landmarks, each of which has its unique, nonconcentric envelope of error, delineate all structures. Some landmarks change with patient position (pogonion), some are simple constructs and do not exist (articulare), while others represent anatomical points (nasion). The representation of the contours between points is questionable, which is illustrated by unsophisticated computer graphics that consist of multiple straight lines instead of curves. Curvilinear forms are best evaluated by methods designed specifically for that purpose.⁴²

Other problems also are apparent. Often distances are measured that have little biologic meaning, for instance measuring across structures that are unrelated (upper teeth related to the mandible). Superimposition techniques assume all change occurs away from the point of registration (for example observations of menton when observing mandibular change relative to the cranium), and assume that increments of change between points are equal. Finally, angular measurements can be confusing to interpret, because not just one point can be confidently assumed to be moving (e.g. nasion can change as readily as pogonion in the angle S-N-Pg) and changes in one dimension can influence interpretation of another dimension (e.g. vertical changes appear to make anteroposterior alterations).

Several cephalometric analyses have gained some favor in the research community, because they address these problems. Moorrees introduced the first transformational analysis in the form of the mesh diagrams that located the area of facial distortion, when compared to normal facial patterns.⁴³ Other transformational analyses are those of Baumrind and Bookstein.^{44,45} These methods attempt to deal with overall changes in shape, in different manners. The Baumrind method is based on a small number of linear measures familiar to the clinician. The tensor analysis of Bookstein demonstrates maximum and minimum vectors of change for selected triangles based on traditional landmarks. In spite of the reported efficiency of Bookstein's method

this technique remains essentially a research method, not readily incorporated into practice or understood by clinicians. Interestingly, this method showed findings similar to those found by conventional treatment of the data in some studies.^{46,46}

New developments in medicine indicate that within the next decade new diagnostic techniques and imaging systems will be used in clinical treatment and scientific investigations of dentofacial biology. New perspectives may be gained by computerized manipulation of images. Certainly the routine use of hard copy radiographs will be lost to computerized image storage. The challenge will be to make the techniques provide information that clinicians can understand, or completely alter conventional thinking to match a new understanding of dentofacial growth. Either is a formidable task.

TREATMENT METHODS

Materials

Although changes in appliances altered patients' perceptions of treatment methods and simplified the clinical techniques of orthodontics, these changes had little effect on its goals and philosophies. The understanding of "quality orthodontics" is essentially unchanged. These technical changes are often time saving, but offer few easy treatment solutions.

ATTACHMENTS

Since the late 1960s, dramatic changes occurred in the methods used to attach appliances to teeth. Although bonding was attempted before the evolution of the acid etch/resin system, this advance made appliance attachment without bands a reality.⁴⁸ This revolution affected all stages of orthodontic treatment (i.e. placement of appliances on erupted and partially erupted teeth; management of tooth size problems with stripping, or the addition of a resin during finishing; space management during removal of the appliance; and design of the retainer during finishing.⁴⁹ All these changes result in less chair time for the dentist and patient.

Today's bonded appliances are smaller and more esthetic than bonds, but smaller bracket dimensions reduce rotational control, which is not without consequence. Lingual appliances appeared and drew some followers as an alternative approach to improve esthetics, but long-term survival and impact of this type of appliance is questionable.

Recently, ceramic and other crystalline materials were

introduced that provided even better esthetics than the small metal appliances. Initially, there have been problems with durability, retention, and removal of this type of appliance. Undoubtedly these problems will be solved and similar materials will mark the way of the future.

Careful management of the bonding system and clinical technique remain critical. Today's attachment occupies less of the tooth surface, makes cleaning easier and impinges less on the gingiva, but the interface of the attachment and the tooth is still the most susceptible area for decalcification and decay. Aggressive oral hygiene regimens augmented by fluoride and antiplaque rinses are sometimes required. The pattern of decalcification changed, not its presence.

PRESCRIPTION APPLIANCES

Another time-saving method implemented during the past two decades was the prescription appliance also known as the "straight-wire" appliance. The idea behind this appliance was to eliminate the numerous adjustment bends in the archwire needed to align the teeth within each arch and assure compatibility between arches, or reduced by making a unique attachment for each type of tooth.⁵⁰ These bends in the wire were necessary because teeth have different contours, rotations, thicknesses, and root positions. By building these differences into the position of the bracket slot, the thickness of the bracket base, and the angle the slot was cut in the bracket, a theoretically straight (really unbent archwire with only archform) would ideally align the teeth. This development undoubtedly reduced the average amount of wirebending that was needed for each patient.

Several realities soon became apparent. Improper placement of the appliance nullified all of the prescription in the appliance and required either changes in placement of the appliance or a return to wirebending. Use of wire of improper or inadequate dimension can alter or eliminate all prescribed torque. Without an understanding of the principles of orthodontics, especially biomechanics, and the realistic advantages of the prescription appliance, the clinician wastes money on expensive appliances.

ARCHWIRE MATERIALS

Another development that changed the clinical practice of orthodontics was introduction of archwires composed of nickel-titanium alloys. Until the 1970s, modern

arch wire was made of stainless steel. The clinician increased the size of the archwires in an ordered fashion to produce increasing increments of force and greater three-dimensional control of the teeth as treatment progressed. This "cross-sectional" approach to mechanics, where the material always remained the same and the size and shape of the archwires were changed, was modified. "Variable Modulus Orthodontics" was introduced in which an attempt is made to fill the bracket slot early in treatment with flexible wires.⁵¹ This was possible because large wire sizes made of the new alloys were very flexible. Then, utilizing wire alloys of different stiffness, appropriate force levels were produced during the remainder of treatment. In theory this approach should lead to more gentle force delivery with longer time between appointments and less discomfort to the patient. In practice, many clinicians use combinations of stainless steel and nickel-titanium wires, in order to exploit the specific properties of each material.

Currently three generations of nickeltitanium archwires are available to the clinician.⁵²⁻⁵⁴ They offer different flexibility, formability, and load-deflection characteristics that are valuable at different stages of treatment. All three types of wires work over longer periods of time than stainless steel, thereby reducing the need for frequent archwire changes and allowing for the possibility of fewer appointments over the course of treatment.

Although these new materials can move teeth more gently and efficiently it appears that the primary inhibitor to faster orthodontic tooth movement remains the rate at which the osteoblast/osteoclast process can operate to form and remove bone. Teeth and individuals also vary considerably, so that better laboratory results may not necessarily imply clinical advantages.

On the horizon are new materials based on plastic and glass fiber materials that show the promise of being as effective as nickel titanium, while providing excellent esthetics. Problems of brittleness, biocompatibility, and production, however, need to be overcome before these materials enter widespread clinical use.

Because of extensive competition between dental supply companies and dentists, technical innovations are often introduced before obtaining sufficient clinical data to substantiate the clinical usefulness and safety of a product. The quest to be first and the attendant financial benefits have the potential to overwhelm ethical considerations. If this strategy is not altered from within the profession, governmental and legal forces will right this trend.

Orthopedic options

Twenty years ago, the USA was at an interesting stage of development with regard to the role of orthopedics in orthodontics. The treatment effect of headgear on facial growth and form were accepted.⁵⁵ The basic concepts of European functional appliances were being introduced and the potential of orthognathic surgery was emerging. During the past two decades, instead of finding one technique to remedy all problems, careful observation of developments illustrated the strengths and weaknesses of several approaches. This led to recognition among thoughtful clinicians that many techniques have a role to play: each modality is best suited to the correction of a particular problem.

Most treatment of growing children with skeletal problems centered on growth modification for Class II relationships. Understanding the importance of vertical control in producing anteroposterior correction led to the use of various types of vertically directed headgear.⁵⁶ Several authors described appropriate techniques for controlling the magnitude, direction, and duration of applying extraoral force.⁵⁷

Limited understanding of the effects of the headgear, along with changing views of appropriate facial esthetics and the role of environmental and functional factors on ultimate facial form, combined to provide a ready acceptance of functional appliances.

Early experience with functional appliances was mixed. There was a plethora of appliances, techniques, and analyses that illustrated our gullibility and lack of understanding of facial growth and treatment effects. Few well-controlled scientific data were available as a basis for rational decision-making.

Recently, several studies improved our understanding of the comparative effects of headgear and functional appliances. Baumrind and associates determined that both functional appliances and cervical headgear produce increases in mandibular growth. Those produced by the functional appliances were slightly greater but still only averaged 1 to 1.5 mm per year of extra growth. They found functional appliances also had an orthopedic effect on the maxilla that was about half of that seen with headgear.^{58,59}

Johnston also evaluated the effects of treatment with these appliances and found that both techniques produced about 4 mm of molar correction.⁶⁰ In the case of functional appliances, this was primarily due to extra mandibular growth, while in the headgear sample this was balanced by greater distal movement of the maxillary molars. Overall, both techniques were found to be effective at producing a Class II correction; the dif-

ference was only in how the correction was accomplished.

Not surprisingly, the modest nature and biological variability of the results of skeletal treatment with the functional appliance and headgear are becoming apparent. Dental changes appear to be a major component of treatment effects aimed at skeletal malocclusion and must be reintegrated with our thinking.

Combinations of headgear and functional appliances have been suggested and are in widespread use with apparently good clinical results.⁶¹ These appliances may provide the ability to manage interactions between anteroposterior and vertical problems, although clinical trials are required to determine whether these treatment effects are an improvement over either method used independently.

Reverse-pull headgear and particularly facemasks of the type described by Delaire are now a popular means for addressing Class II malocclusions in the mixed dentition.⁶² These appliances are capable of producing significant forward movement of the maxillary incisors and backward rotation of the mandible, resulting in correction of the malocclusion.

Their ability to produce stable skeletal maxillary advancement, however, is yet to be adequately documented. Shapiro and Kokich demonstrated the use of ankylosed teeth to obtain a purchase on the maxilla, which resulted in considerable skeletal changes without dental effects.⁶³ The possibility of combining facemasks, or for that matter headgear, with osseointegrated implants for direct application of force to the skeletal structures has considerable potential.⁶⁴

Dental options

The following discussion will focus on the dental structures, but they cannot be viewed in isolation from other facial and supporting structures. Simon introduced a major advance, when he oriented the dentition in the face.⁶⁵ Although his concept of the orbital plane and its relationship to the dentition was incorrect, consideration of the dentition as part of the face, which needed to be in harmony with the surrounding structures, was largely lacking to that point. Shaw's investigation of dental esthetics and the role the dentition plays in overall facial esthetics, is helping place orthodontic need and demand for treatment in a new context.⁶⁶

INTEGRATION

The following examples illustrate how new treatment directions now consider the dentition in a broad con-

text especially related to orthodontic treatment. Often this involves carefully considering the dentition's relationships to surrounding structures. Treatment of posttraumatic dental injuries is a good example. Consolidated, laterally displaced teeth have always required orthodontic movement, but intrusion injuries were either surgically repositioned or left, for a period of time, to reerupt. Recent clinical experience and other data appear to indicate that better results, in terms of tooth and supporting-tissue morbidity, are achieved, when traction is begun soon after the injury.⁶⁷ This technique lessens the chance of ankylosis, provides quicker and better access for endodontic treatment when necessary, and allows direct visualization and evaluation of the injured tooth in a shorter time.

Another example of integration is to use orthodontic treatment in conjunction with soft-tissue manipulation, while treating unerupted and impacted teeth.⁶⁸ Direct access to the teeth by generous removal of overlying tissue and lassoing the cervical part of the tooth has been replaced by conservative manipulation of tissue and bonding to crowns.⁶⁹ By means of orthodontic traction, the tooth can be properly positioned over the alveolus in healthy tissue. These are common clinical examples, by today's standards, of difficult situations that produced variable clinical results two decades ago. Integration of the dentition and orthodontic care with the context of total patient care, to enhance oral health, is a refreshing and long-overdue step.

A final example of integration of the dentition with the functional structures involves consideration of temporomandibular disorders (TMD). Progressive thinking dictates that this is not a dental problem, but an orthopedic problem with the dentition as one potential contributor.⁷⁰ While there has been considerable interest in adult TMD for many years, it is only in the last decade that attention focused on this area in the pediatric age-group. When all signs and symptoms found in various studies of children are evaluated, their prevalence is highly variable and often incomparable, while showing limited reliability and validity.⁷¹ No specific malocclusion or psychological set is significantly related to TMD in children.⁷⁰ Oculal interferences are not clearly implicated as diagnostic or contributing signs and provocation studies that introduce occlusal discrepancies have not been accomplished with children.⁷²

Several studies addressed the question whether orthodontic treatment creates TMD problems and clearly showed that orthodontic treatment does not increase the functional risk to patients.^{73,74} Presently, orthodontic treatment does not appear to be preventive or

curative as far as TMD problems are concerned. Despite considerable attention to the matter in the media, it also is unproven whether the extraction of premolars predisposes patient to TMD problems, or whether the use of functional appliances is a more effective TMD treatment modality than other techniques. TMD pain and dysfunction affects a small percentage of children who probably benefit from conservative, symptomatic, reversible treatment.⁷⁵ This problem needs further investigation of prevalence, diagnosis, and treatment strategies, using scientifically accepted techniques.

EXPANSION VERSUS EXTRACTION

To extract or not extract, is a question that has haunted clinicians since orthodontics first began. Unfortunately, experience during the past two decades has brought us no nearer to the answer. We do, however, have the ability to draw on research that examined certain aspects of the problem. The ultimate question that remains unanswered is whether long-term, post-retention stability is better, when a case is treated by expansion of dental arch dimensions, or by extraction of permanent teeth. The post-retention studies from the University of Washington demonstrated that extraction alone is no guarantee of long-term stability and that it is normal for patients, both treated and untreated, to have some increased crowding in early adulthood.^{76,77} Parallel studies on cases with similar amounts of crowding that were treated by nonextraction are not reported in the literature. Evaluations of mild crowding showed that significant changes in arch-form were unstable 70 percent of the time and that the amount of incisor crowding seen ten years postretention was intermediate between untreated normals and four first premolar extraction cases.^{34,78}

Recently there has been a rise in popularity of "Cetlin" type mechanics, involving the use of maxillary transpalatal arches, headgear, removable appliances, and mandibular lip bumps to gain arch-length. Few data are available on this mode of nonextraction therapy, but a recent evaluation of the effects of one year of lip bumper therapy revealed that the mandibular incisor came forward an average of 1.5 mm due primarily to three degrees of anterior tipping. Three degrees of posterior tipping was noted on the mandibular first molar, but no distal bodily movement. Intercanine width was increased by about 2 mm and intermolar width increased by about 3 mm. These changes combined to produce increases in arch-circumference, averaging close to 5 mm in one year.⁷⁹

Twenty years ago serial extraction was at its peak,

with many clinicians finding that the sequential removal of primary and permanent teeth provided relief from arch-length deficiency. With the swing of the pendulum toward nonextraction therapy and the criticism serial extraction received regarding the potential flattening of the facial profile, lingual movement of the lower incisors, and bite deepening, it became less commonly employed. Fair evaluations were made only recently, using large longitudinal serial extraction samples. These studies revealed little lingual movement and tipping of the mandibular incisors (about 0.5 mm and 1.5 degrees) and only minimal increases in overbite (approximately 1 mm) during the drift period.⁸⁰ At the ten-year postretention stage, however, these cases showed amounts of crowding similar to that found in patients who had four first premolars extracted in adolescence.⁸¹

A therapy suggested as an alternative to four-premolar extraction, is the removal of second molars. It has been suggested that this extraction regimen will result in shorter treatment time, prevention of late lower-incisor crowding, easier overbite control, greater ability to move first molars distally with less chance of producing an unesthetic "dished in" face, and fewer temporomandibular joint problems.⁸² These claims have been subject to little rigorous scientific evaluation and only recently some data on the technique became available. These studies suggested that, when used in combination with a functional appliance, Class II skeletal correction was achieved by a combination of the inhibition of maxillary growth and a normal amount of forward mandibular growth. No significant distal movement of the maxillary molar was noted despite a treatment time of over three years.⁸³ While the technique was successful at producing 2.5 to 3.5 mm of increased arch-width and 1.2 and 3.5 mm of increased archlength, there are no data available on the stability of these changes nor on the long-term effects on incisor crowding.

Overall, the pendulum moved to the nonextraction side since 1969 and should now be headed toward a more moderate position. It must be remembered that archlength is not the only variable that needs to be evaluated before a treatment decision is made and that postretention crowding is not the only criterion for successful treatment. Sufficient data are not available to make treatment decisions on a logical, scientific basis.

CONCLUSION

Growth and development has moved toward a functional theoretical base, but hypotheses need testing to

substantiate this position. Our understanding of growth is insufficient to predict its course accurately or to master basic dentoskeletal interactions.

New diagnostic techniques will be introduced that will require changes in our basic understanding of growth and treatment. These will gain uneasy acceptance as simple explanations die hard. Better understanding of function will improve and complicate diagnostic methods.

Materials will continue to improve and simplify the technical aspects of orthodontics, but they will be no substitute for understanding biomechanical principles. Understanding the basic mechanism of tooth movement and eruption will provide more treatment advantage than better machinery.

True orthopedic treatment will provide improved treatment possibilities, when forces can be applied directly to the skeletal structures. Then, the scope and timing of treatment may be drastically altered.

Continued integration of orthodontics with total patient diagnosis and treatment has the potential to provide better results in many phases of dentistry.

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THE STOMATOGNATHIC SYSTEM

Before we can evaluate dysfunction and disease, we must have a clear picture of normal function and health. The basis for cause-and-effect diagnosis is an understanding of normal form and its relation to function. The anatomist Moffett has observed that "we will not find much of a disturbance in function without having a corresponding degree of alteration in structure." The healthy interrelationship between form and function provides us with a base line that can be used in distinguishing normal function from pathofunction.

A basic knowledge of the stomatognathic system starts with the temporomandibular joint, since it is the center of structural and functional interrelationships.

Some of the most obvious aspects of the temporomandibular joint are often missed, even though they are extremely important. In fact some of the most popular techniques for treating temporomandibular disorders are based on misconceptions of how the joint functions, and many of the procedures that are advocated for restorative or orthodontic treatment are either unnecessary or detrimental to long-term stability. To relate each aspect of form to function, it is helpful to separate the various components of the joint into understandable segments, starting with the passive structures of articulation and then progressing to an understanding of how the active elements make the system function.

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Restoring the oral health of the child

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During the past twenty years, we have witnessed quantum leaps in the technology of oral health care for the child and adolescent. While the range and complexity of services we can provide may seem mundane in the context of day-to-day practice, a retrospective of these past twenty years provides a renewed respect for our progress. Obvious areas of immense technological change are the materials we use and the speed with which our care can be rendered. Less obvious, but equally important, are the variations of techniques for the application of these materials and the understanding of the biology supporting our treatment protocols.

When considering the evolution of restorative dentistry for primary and young permanent teeth, the phenomenal explosion of the use of adhesive technologies and the attention to acceptable esthetics come to the fore. Our presence on the threshold of identifying and employing truly biologically compatible materials is exciting to everyone who treats children. The ability to prevent oral disease in children has achieved enormous, documented success. Referring to dentistry's heritage, Irwin Mandel, Director of the Clinical Research Center at Columbia, recently said at an IADR meeting, "We are not as quick on the draw!". The fact that 50 percent, and probably more, of the children in the United States are caries-free through age seventeen does not diminish the need for continued efforts in developing new modalities of restorative care, pulp therapy, and trauma care. Research in these areas continues unabated; the progress is admirable.

Our specific purpose here is to review many of the significant advances in each of the above areas of care

for the child and adolescent over the last two decades. While attempting to be comprehensive, a review of this length cannot be exhaustive of our progress. In light of our intention to honor the role of Dr. George Teuscher in reporting advances in oral health care for children, particular attention will be directed to the *Journal of Dentistry for Children* as a standard bearer for research in basic science and in the clinical application of new technologies.

THE "ENLIGHTENMENT" IN RESTORATIVE DENTISTRY FOR THE CHILD AND ADOLESCENT

By the mid-1960s, it was generally accepted within the profession that primary teeth merited restorative care, pulp therapy, and related measures to ensure the integrity of the child's primary and mixed dentitions. In 1969, McDonald's first edition of the classic *Dentistry for the Child and Adolescent* stated, "There is not complete agreement regarding the type of cavity preparation that should be made in a primary tooth.¹ Although the classic G.V. Black principles of cavity design were being questioned on the grounds of differences in the histology and biology of primary teeth, principles such as "extension for prevention" and the "prophylactic odontotomy" were still the practice of the day. The internal stress reduction and pulpal avoidance inherent in preparation design modifications such as the rounded line angle and new found respect for the direction of the enamel rods in primary molars were evolving a new preparation design in primary teeth. The material of

choice for most restorations, even where esthetics was an issue, was amalgam; all too occasionally stainless steel crowns were employed for seriously compromised posterior and anterior teeth. Technically challenging "shoed-cusp" restorations, such as the "infamous" mandibular primary first molar distal-occlusal-lingual amalgam were the treatment of choice taught and used in practice. McDonald also noted that "approximately 70 to 80 percent of the cavity preparations in primary teeth will be of the Class II variety."²

Though the effects of fluoridation and professionally prescribed preventive techniques were beginning to be noted, the majority of children still presented with posterior proximal carious lesions and all too frequently with anterior caries as well. The practitioner, faced with the need to provide acceptable restorative care in an expeditious fashion, particularly to avoid creating behavior management problems, would attempt to create an acceptable treatment plan. The development of the treatment plan was supported by a raft of radiographs, often taken before the clinical examination of the child and rarely focused on the individual child's problems. Under considerable pressure from a parent, the utilization of polycarbonate or stainless steel anterior crowns with facings would be considered as aesthetically acceptable restorations. Aesthetics, by necessity, was the last consideration in light of the need to provide durable restorations. The behavior management of the child compromised ideal but complex treatments, since local anesthetic often was not provided. The rubber dam was assiduously avoided, and the lack of application of four-handed, seated dentistry further undermined the ideal provision of care.

When confronting these conditions in the late 1960s, the practitioner would rely on techniques learned in dental school and had essentially only the *Journal of Dentistry for Children* and a few *Journal of the American Dental Association* articles for reference in determining contemporary standards.

The posterior proximal carious lesion was most frequently prepared with sharp line angles. The isthmus was too narrow; the most frequent failure of these posterior restorations was fracture through the isthmus area and failure of the proximal box aspect.

In 1977, Myers examined factors that produced failures in Class II amalgam restorations in primary molars. Building on an article by Yates the year before who compared the effects of preparation design on fracture strength, Myers' effort recognized the uniqueness of the primary molar; the need for change was evident.^{3,4} Several years later, Alexander paid particular

attention to the axiopulpal line angle and fracture resistance using various amalgams.⁵ Research began to support the concept of rounded line angles to reduce internal stress; the contemporary proportions of isthmus width and minimal "self-cleansing" dimensions for the proximal box gained new respect.

The difficulties of providing quality restorations for children were described by Webster in 1981, when he evaluated large numbers of restorations in a children's dental program.⁶ Research into alternative styles of complex amalgam restorations included the slot-retained complex amalgam presented by Barney.⁷ All aspects of design and the effect of technique on the success of amalgam posterior proximal restorations were being examined. Bimstein investigated the types and nature of errors in cavity preparation in a preclinical course.⁸ He paid particular attention to the possible clinical implications of our teaching methodologies and pointed out the surprisingly technique-sensitive aspects of posterior amalgam placement. The acceptability of amalgam restorations periodontially was examined by Van Amerongen in 1986, when he provided a radiographic and clinical analysis of the cervical margins of amalgam restorations.⁹

As the limitations, particularly of size, of the application of amalgam as the material of choice became more apparent, various investigators examined the application of the stainless steel crown more carefully. In 1976, Myers suggested that the stainless steel crown might be the restoration of choice for seriously compromised posterior primary teeth.¹⁰ One year earlier, Braff compared stainless steel crowns and multisurface amalgams in primary molars and demonstrated that the stainless steel crown was a more serviceable restoration in most instances.¹¹

The effects of variation in tooth preparation on the long-term retention of stainless steel crowns was reported in 1978 by Savide.¹² An overview of the technique was provided in that same volume by Fieldman, who presented a "simple, efficient method for utilizing the stainless steel crown."¹³ Surprisingly, with this extensive research into the utilization of stainless steel crowns, there still was resistance to their application in practice, necessitating articles such as that by Dawson again comparing amalgam and stainless steel crowns.¹⁴ Rector continued the discussion of the design of the preparation and focused particularly on crown adaptation for improved retention.¹⁵

The perceived resistance on the part of certain practitioners to employing the stainless steel crown centered on concerns of periodontal health. Seven articles

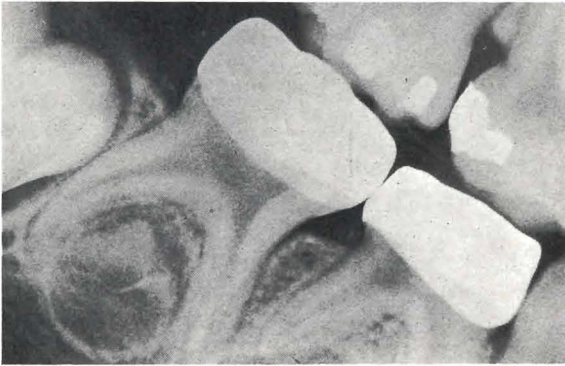


Figure 1. Correctly trimmed and contoured stainless steel crowns surrounded by healthy gingival tissue.

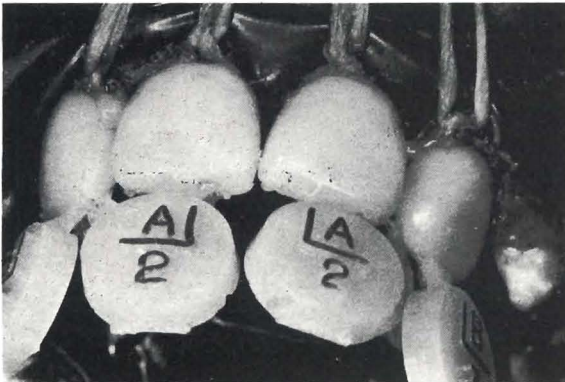


Figure 2. Initial placement of polycarbonate crowns, cemented with adaptive resin material.

in the last twenty years focused on that particular issue. In 1975, Myers reported a clinical study on the response of gingival tissues to stainless steel crowns.¹⁶ Peterson in 1978, utilized the scanning electron microscope to study stainless steel crown margins.¹⁷ Lubik investigated the *in vitro* adherence of *S. mutans* organisms to stainless steel crowns.¹⁸ His work was expanded by Durr who studied plaque accumulation on stainless steel crown margins and the effect on gingival health.¹⁹ Checchio in 1982, furthered the investigation of periodontal reactions to stainless steel crowns and clearly demonstrated that they did not initiate periodontal problems.²⁰ Technique matters continued to be investigated by researchers such as Martens, who presented specific techniques to create acceptably polished margins.²¹ Finally, in 1984, Einwag reported on the effect of entirely preformed stainless steel crowns on periodontal health in both the primary and mixed dentitions.²² In summary, all of these articles supported the clinical application and the biological com-

patibility of the stainless steel crown as a solution to the problems of complex posterior amalgam restorations.

Significant attention had been brought to bear on the problems of the posterior restoration in the primary and the mixed dentitions. Others engaged in studies to address the need for biologically and esthetically acceptable anterior restorative techniques for primary teeth. Alternative modalities were sought by individuals such as Frigoletto, who in 1976 suggested a "simplified treatment" of nursing bottle syndrome based on anterior proximal discing and intensive fluoride application.²³ The polycarbonate crown was available to practitioners caring for children. It suffered, however, from major problems with retention. Kopel compared various cementing agents for application with polycarbonate crowns.²⁴ In practice no acceptably reliable retention method was established for the use of these esthetic, but overly-flexible and difficult to manipulate full-coverage restorations. Attempts were made to adapt the stainless steel crown for the esthetic restoration of seriously decayed anterior teeth. Hartmann, in 1983, commended the open-faced stainless steel crown as an esthetic alternative.²⁵ Helpin in the same volume reported on the application of this technique as an alternative to the limited anterior restorative materials currently available.²⁶ The technique of creating facings in stainless steel crowns, and applying resin materials for esthetics was investigated even for posterior teeth by Roberts.²⁷

The concern for anterior esthetics was manifest not only in the search for acceptable anterior restorative materials, but also in attempts to ameliorate staining or discoloration. A comprehensive overview of esthetics in the primary dentition was provided by Joho.²⁸ Others such as Mouradian and Power suggested bleaching techniques and related approaches to dealing with tetracycline staining and fluorosis.²⁹⁻³¹ Reid presented an article that extensively reviewed bleaching of tetracycline stained teeth.³²

Esthetic prosthetic techniques for children with oligodontia or extracted teeth were also being reported. For instance, Joho suggested several solutions to prosthetic problems in the primary dentition, and Groper reported on custom veneers and resin-bonded bridges.^{33,34} Haney presented a case of full denture fabrication for a child with multiple maxillary anomalies.³⁵

It was in this melange of efforts to create esthetically acceptable dentistry for children that the eventual effects of Buonocore and other early researchers of adhesive or bonding materials began to have an effect on

clinical care. Although addressed in detail in Nowak's companion paper on prevention in this issue, the development of sealants was a major new technology reported early in the *Journal of Dentistry for Children*.

Gift reported on attitudes toward and the use of pit and fissure sealants.³⁶ Jeronimus in an important paper in that same year reported on the viability of cariogenic microorganisms under dental sealants.³⁷ Merrill discussed methods for evaluating the success of pit and fissure sealants, and Doyle presented the results of a five-year study on the longevity of the prototypical sealants then available.^{38,39} Technique issues for bonding to primary enamel assumed center stage with researchers such as Fuks reporting on the apparently prismless surface layer of enamel in primary teeth and its effective management through mechanical and acid treatment.⁴⁰ Eidelman also reported on the structure of the enamel in primary teeth and suggested technique modifications to ensure success in using etch-retained materials.⁴¹ Koniff in that same volume, also addressed the preparation of primary tooth enamel for acid conditioning.⁴² Davila used both clinical and microscopic techniques to investigate possible applications of this technology to prosthetic issues, such as etch-retained bridges and their long-term retention.⁴³

Bonded materials themselves came under serious investigation; it seemed that a new material or bonding agent was introduced every month. Only through the monitoring of journal articles was the practitioner able to sort the good from the bad. Kun reported an early adhesive material for composite resins.⁴⁴ Hicks researched basic biological issues supporting the varied applications of this rapidly developing technology.⁴⁵ Focusing on the preventive resin restoration, he suggested that the critical area was the enamel-resin interface. Using extensive SEM technology, Hicks illuminated the different etching patterns, resin tag morphology, and related issues at this interface. Davila investigated marginal adaptation of composite resins and the early status of dentinal bonding agents.⁴⁶

In addition to the investigation of the clinical efficiency of and technology for sealants and composite restorations in the anterior teeth, laminate veneers were developed. Burgess reported using laminate veneers for the restoration of teeth affected by dentinogenesis.⁴⁷ Helpin provided an article on the use of heat to better adapt the contours and margins of laminate veneers, and he gave a general overview on "trouble-shooting" for these restorations.⁴⁸ Investigation continued into the new microfill materials either alone or in combination with a "core" of conventional composite for fracture restorations. Microfill veneers offered bio-

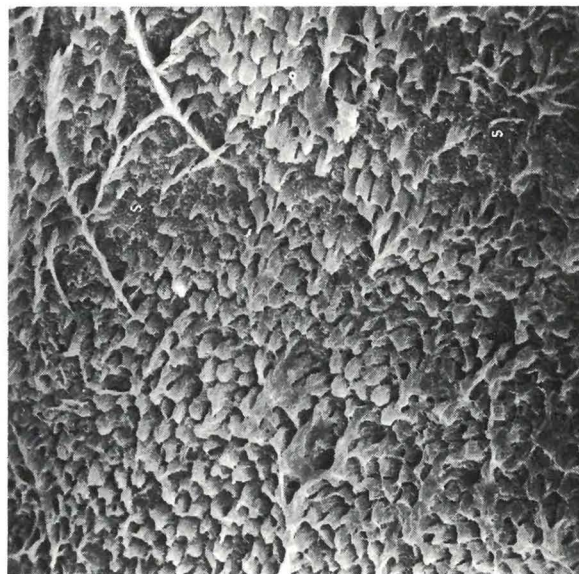


Figure 3. At lower magnification areas relatively smooth (s) become evident (Mag. $\times 500$).

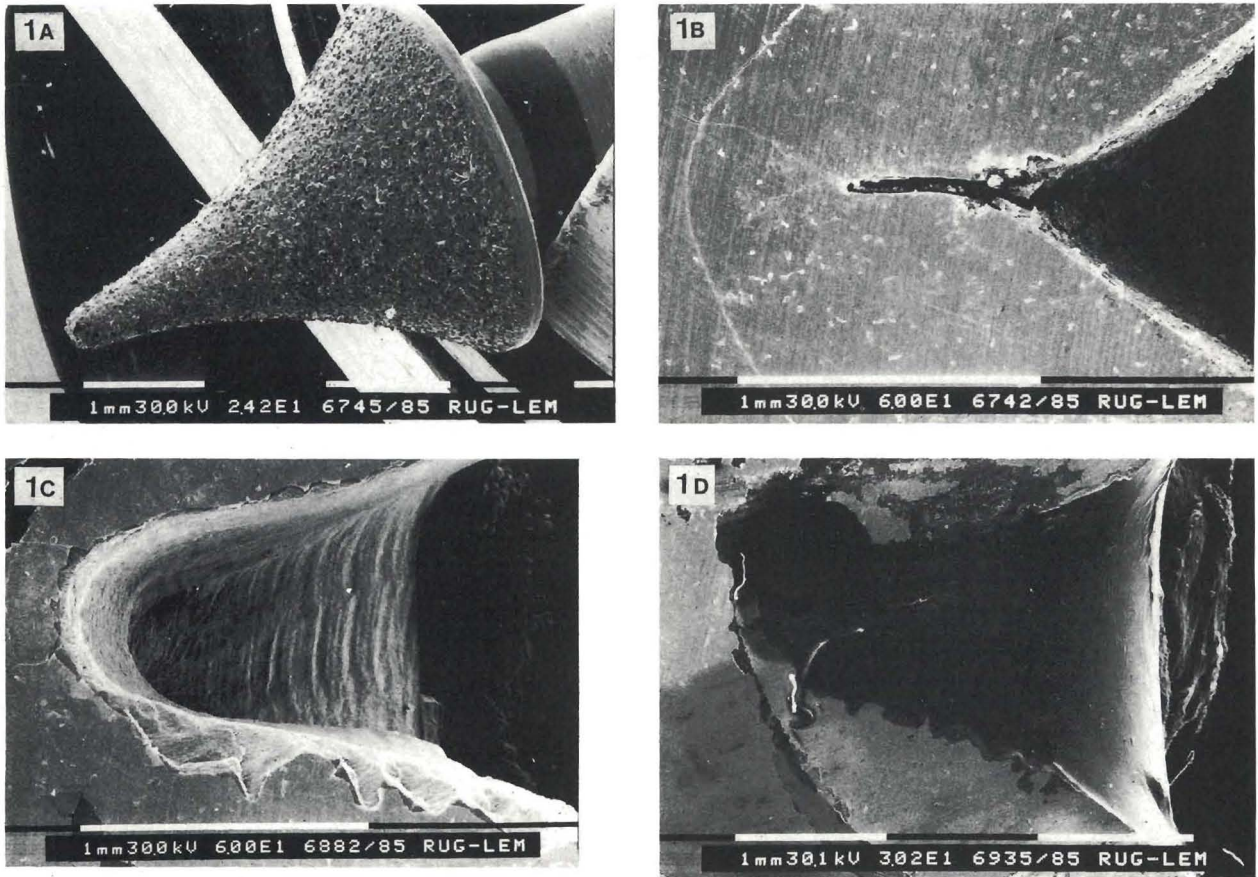
logical and aesthetic advantages in the "hand" build-up of these teeth, but at cost to other properties such as thermal expansion.

Variations of the composite materials underwent continuous development and scrutiny. Nunn reported on a major problem with many of the available materials, the limits of their color stability.⁴⁹ In the same volume, Khanna compared four currently available composite materials by their bond strengths and noted significant differences.⁵⁰

It was only natural to expect that these materials would soon be utilized in the posterior dentition. In 1981, Leifler listed clinical success rates over two years for proximoclusal composite restorations in primary molars.⁵¹ A landmark paper by Houpt suggested a significant technique variation in the use of fissure sealants in lieu of "extension for prevention". Henderson followed with a specific protocol for a sealed composite resin restoration.⁵³ Varpio's presentation of a six-year follow-up on proximoclusal composite restorations in primary molars was encouraging; yet the problems with marginal loss of integrity due to materials limitations, e.g. surface "plucking", continued to restrain applications of the technique.⁵⁴

The continuing investigation of bonding agents resulted in numerous reports comparing materials. Holan presented *in vitro* data on the applicability of a specific dentin bonding agent bond to prevent marginal leakage in Class I composite restorations.⁵⁵ Other re-

Figure 4. 1A, Bur type number 806-314-466514-031 (Komet, SEM $\times 24.2$) 1B, The fissure before preparation (SEM $\times 60$). 1C, The fissure after preparation (SEM $\times 60$). 1D, Sealed fissure (Helioseal, Vivadent, SEM $\times 30.2$).



searchers investigated dramatically different types of posterior preparations using newer materials. Croll presented the glass ionomer/silver cement Class II "tunnel preparation", a radically revised approach.⁵⁶ New methods for the handling of the materials and their placement attacked the problem of internal shrinkage of the materials during

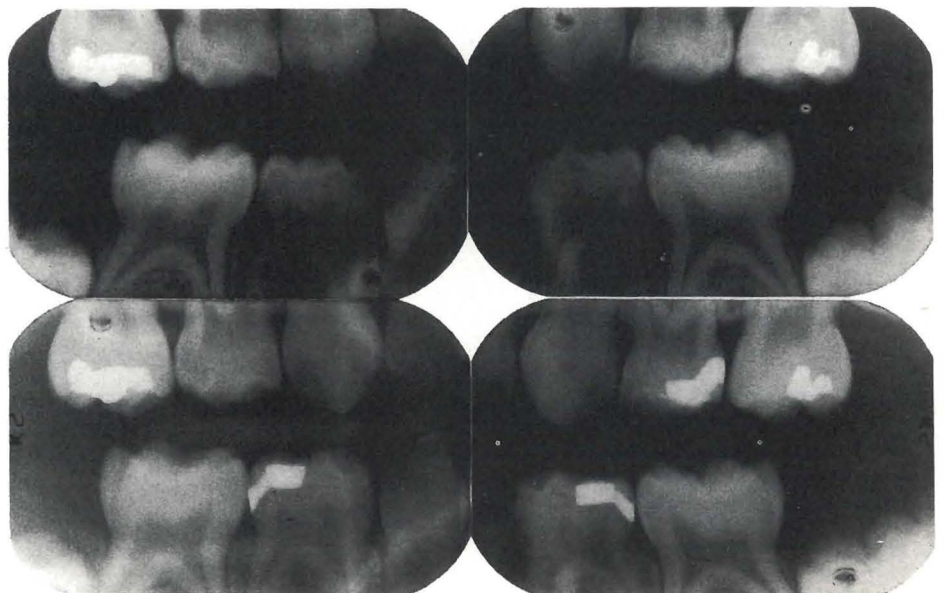


Figure 5. Preoperative radiographs (above) and six months postoperative radiographs (below) are shown. Both left primary first molars also were restored with Ketac-Silver tunnel restorations.

curing. Fisbein reported on the effects of a light-cured bonding agent and a technique involving placement of angled increments of composite material in an effort to reduce leakage around Class II composite restorations.⁵⁷

Although currently there are a myriad of materials and techniques available and under investigation, and although there are ADA accepted materials for posterior Class I and "selected" Class II restorations, the perfect material remains to be identified. The harshness of the oral environment and the uniqueness of the biology of dental tissues continues to confront the practitioner with the need for new techniques and improved materials to address the restorative needs of children. Recent articles such as that of Lee in 1986, discussing bond strengths for porcelain discs applied with various bonding agents, point out the continuing need for creative approaches to anterior esthetic dilemmas.⁵⁸ Studies such as that of Foreman, who illustrated a technique for direct bonded glass ionomer crowns, demonstrate the vital role of the creative clinician in our literature.⁵⁹

THE DENTAL PULP

Careful respect for the dental pulp has been a primary precept of restorative care for children since the inception of such care. Early investigations into pulpal morbidity in the primary and young permanent dentitions were necessitated by deep caries and by trauma incurred by children in the late 1960s. Techniques such as the several stage formocresol pulpotomy developed by Charles A. Sweet, Sr., and the comprehensive overviews of the management of primary tooth pulps such as those of Starkey served to underscore our lack of understanding of the biology of the primary dental pulp.

Extensive research in this area has been reported in the last twenty years of the *Journal of Dentistry for Children*. Specific techniques for pulp therapy and possible sequelae have merited much attention. Willard reported on the incidence of radiographic changes following formocresol pulpotomies in primary molars.⁶⁰ Snawder presented an update for the management of severely diseased primary anterior teeth with special emphasis on the pulp. Given residual concerns for possible negative effects from the use of formocresol, various investigators researched alternatives.⁶¹ Eggers reported on the treatment of infected tooth pulps with vancomycin and hyaluronidase.⁶² Others investigated the direct effects of formocresol. Ranly, in one of numerous publications on the subject, investigated the

loss of formaldehyde incorporated into zinc oxide and eugenol cements used for canal obturation in pulpectomies.⁶³ Boeve reviewed radiographic evaluations of primary molars that had received formocresol pulpotomies.⁶⁴ The search for alternatives, spurred by the work of Myers on the systemic distribution of formocresol components, led others, such as Davis to investigate possible alternative medicaments, for example glutaraldehyde.^{65,66} Ramos contrasted the effects of formocresol and glutaraldehyde on rat pulp cellular respiration.⁶⁷ Ranly continued his studies with an assessment of the systemic distribution and the toxicity of the formaldehyde in formocresol after pulpotomy treatments, and Mulder investigated the effects of formocresol pulpotomies in primary teeth on their permanent successors.^{68,69}

The direct effects of materials used in restorative care on the pulp merited significant investigation. Brannstrom described pulpal reactions to IRM cement and other intermediate restorative materials with a eugenol base.⁷⁰ Nordenvall investigated pulpal reactions and in particular the numbers and types of microorganisms that could be observed over time under various restorative materials.⁷¹

Calcium hydroxide continued to attract attention as a key component of liners, bases, and in its pure form as a direct medicament. McCormick reported on nineteen years of follow-up of a calcium hydroxide pulpotomy.⁷² Calcium hydroxide as a direct pulp capping agent continued to merit attention as shown by Jerrill.⁷³

The intricacies of the pulpectomy technique resulted in studies like that of Rifkin, a three-year review of root canal treatment for abscessed primary teeth.⁷⁴ Garcia-Godoy presented radiographic evaluations of root canal calcifications following formocresol pulpotomies.⁷⁵ Spedding reported on the effects, or lack thereof, of the incomplete resorption of zinc oxide root canal obturation materials as commonly used in primary tooth pulpectomies.⁷⁶ Subsequently, Garcia-Godoy reported on the potential of an iodoform paste for root canal therapy of infected primary teeth.⁷⁷

The quest for techniques for the prevention of pulpal morbidity and for managing the hyperemic or infected pulp continues. As newer restorative materials and methodologies appear, the need to assess their effect on the pulp demands our attention and our constant contact with the current literature in order to apply most aptly these methodologies in our day-to-day patient care.

TRAUMA IN THE PRIMARY AND MIXED DENTITIONS

No area of clinical care and research more exquisitely combines issues in restorative care and pulpal management than does the care of the child with a traumatic dental injury. In addition to presenting a true medical emergency, dental trauma extends beyond the visible structure of the tooth to include the surrounding tissues and the pulp, and may present long-term sequelae. Research into appropriate management of traumatic injuries brings together pulp biology, restorative techniques and materials, and emergency management. It is perhaps the one area that demands the highest creativity of the practitioners. All of this combines in a most difficult moment in the management of the child and in the decision making process of the practitioner.

Developing from a time in which there was little hope for a seriously fractured, luxated, or particularly, an avulsed tooth, we now possess a myriad of techniques that offer hope for the preservation, retention, and esthetic acceptability of traumatized teeth. Anderson presented the management of the partially avulsed tooth, a difficult clinical situation implying probable loss of vitality, immediate instability, and questionable long-term retention.⁷⁸ Schusterman provided a technique for replantation of the traumatically avulsed, immature permanent incisor.⁷⁹ Suggestions for dealing with replantation were also provided by Walsh, who investigated then acceptable approaches to apical modification and effects on the vitality of replanted permanent teeth.⁸⁰

Macko produced epidemiologic data on the incidence of fractured teeth in a school population.⁸¹ Macko's data convincingly presented a case for the need for further research given the high incidence. Joho provided a contemporary overview of the management of trauma in the primary dentition in 1980.⁸² Prevention of these injuries was the focus of Blum's paper supporting "Operation Mouthguard: a school-based program designed to prevent dental trauma".⁸³ Even with such articles demonstrating the importance of appropriate mouth protector use, Maistrello-De-Moya in 1989, was unable to demonstrate the compliance we would wish among high school varsity athletes.⁸⁴

Dealing with the mobilization of teeth subsequent to trauma has attracted considerable attention. In another work Macko suggested techniques for the stabilization of traumatized anterior teeth.⁸⁵ The use of ligatures and acrylic was rapidly being replaced by etch-retained splints. Croll recommended several variations of techniques for the stabilization of the traumatized

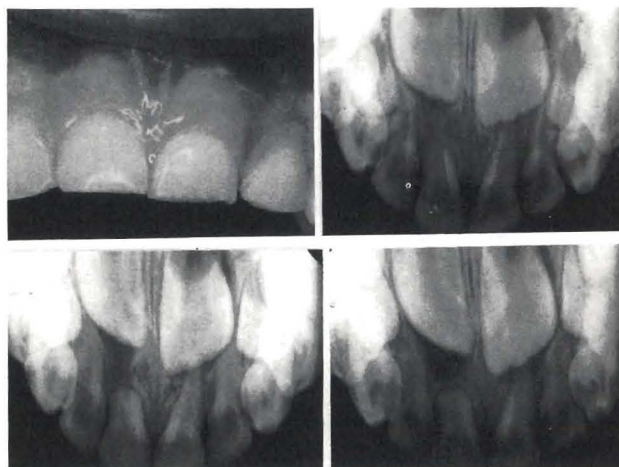


Figure 6. Findings: 5.5-year-old girl struck tooth E at about two years of age. Tooth E was mobile, not sensitive to percussion or palpation; had normal color, and normal associated soft tissues (clinical photograph). Increased PDL space, periapical radiolucency, and external root resorption were seen on the radiograph. The tooth E was extracted approximately forty-two months after trauma.

tooth.⁸⁶ Andersson reported on the application of a fiberglass splinting technique to traumatized teeth.⁸⁷

While researchers investigated methodologies for the retention of teeth, others focused on the pulpal morbidity inherent in trauma. Soxman attempted to link tooth discoloration in primary anterior teeth with the degree and types of pulpal pathology present.⁸⁸ Croll in an exhaustive study assessed the relationship between clinical presentation and histologic findings in traumatically injured primary incisors.⁸⁹ Attempts to prevent external root resorption and to encourage continued root development of traumatized teeth have merited serious investigation. Harbert reported on periapical healing after apico-curettage during apexification, and Chawla investigated the effectiveness of apical closure in nonvital permanent teeth using a calcium hydroxide material.^{90,91} Thater provided a strong follow-up study of induced root apexification after traumatic injuries in children.⁹² In that same issue, Harrington presented an overview of dentofacial trauma in children.⁹³

While much needed attention has been paid to anterior trauma and pulpal management, the Journal has also been a forum for issues in posterior trauma, such as Needleman's article on traumatic posterior dental fractures.⁹⁴ Klein continued such investigation in suggesting treatment modalities for multiple fractures in primary molars and the condyles.⁹⁵ The all too frequent

bizarre effects of trauma were noted by Kennedy's study of unusual sequelae to posterior dental trauma, and Snawder's management of broken tooth fragments imbedded in soft tissue.^{96,97}

Dental trauma in the primary and mixed dentitions serves as the contact point of what is timely in restorative care for children. The union of the search for immediate management techniques and for long-term sequelae therapy brings together much of the last twenty years of restorative care for children. The continuing search for biocompatible pulp therapy and restorative materials unites in this area of care.

THE NEXT TWENTY YEARS

What are the future needs of our research and what will we be reading in our journals for the next two decades, if we now practice and conduct our research in a country that sees 80 percent of oral disease localized in 20 percent of the children? We care for more and more children who have previously fatal medically compromising conditions; they are now surviving such conditions for extended periods of time. Restorative care for children is not about to vanish from the face of the earth. The search for truly biocompatible materials continues. The posterior Class II restoration is and will continue to be needed in practice. Better materials and more conservative preparation designs must be identified and carefully analyzed in large populations over an acceptable period of time. Remineralization techniques offer much hope, as do newer bonding technologies and materials; yet currently we are limited by the highly technique sensitive nature of these modalities.

We are still coming to understand the basics of the diseases we fight. Work such as that of Mejare on the exact nature of deep bacterial penetration of early proximal carious lesions in molars is on the track toward truly biologically appropriate methods for dealing with caries.⁹⁸ Reexamining our accepted technologies continues to merit our serious attention as shown by work such as that of Crimm, illustrating the effects of etchant times on marginal microleakage.⁹⁹ Unless we think all the answers are available for pulp management, consider the paper of van Amerongen reporting the consequences of endodontic treatment in primary teeth.¹⁰⁰

Our resources to provide care and the limitations on access to care for significant segments of the children in our country are frustrating. For every "geriatric" individual living under poverty conditions there are three children. Perhaps the most important area of current investigation is the search for microbial or related

predictors for individuals at risk for dental disease. Resources must be focused on the children most at risk, that same 20 percent. Our materials and our methods are good and have come light years during the twenty-one years since George Teuscher assumed the editorship of the *Journal of Dentistry for Children*. His efforts and the efforts of all those authors reported in that Journal have enabled us to enter a new world of oral health care for children. Yet they only have opened the door to what should be our true goals of prevention and minimal additional trauma to or destruction of sound structure. As the physician Galen said "Above all else, do no harm".

It is our hope that when next confronted with a three-year-old girl sitting in the chair with a dental injury, we will be able to reflect on the reports and efforts of our researchers and do Galen one better.

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ABSTRACTS

Kohn, Donald W.: Twenty-one years of child advocacy: An editorial retrospective of the Teuscher years. *J Dent Child*, 57:18-23, January-February, 1989.

During the past twenty-one years—126 issues of *Journal of Dentistry for Children* have been published under the editorship of George W. Teuscher. Editorial themes can be classified as pertaining to several categories: preventive dentistry; child behavior; professional and government relations; the dental marketplace; dental education; organized dentistry; care for special populations; and ethics and social responsibility. Throughout the phenomenal change in the dental-practice environment, one could always look to the editorial page of the *Journal* for a word of encouragement, historical perspective, and vigorous support. Examples from the *Journal's* archives support the belief that in the face of an information explosion, "the journal is still the best means of presenting new information to the professions.

Dental literature; Prevention; Behavior, child; Professionalism; Government; Economics, dental; Education, dental; Dentistry; Patients, special needs; Ethics

Waldman, H. Barry: A generation of dental services for children: change and similarity. *J Dent Child*, 57:24-30, January/February, 1989.

Changes in dentistry, and pediatric dentistry in particular, are chronicled in this report, with a description of the state of the profession in 1950 compared and contrasted with the environment that exists as we enter the 1990s. George Teuscher, ASDC's *Journal* editor, has overseen and analyzed these changes and similarities for the profession for more than twenty years. Despite vicissitudes of change throughout the profession for a generation, there are capable, highly trained and motivated professionals providing needed health services to society's youth today. The economic picture forecasts an improving return for these practitioners tomorrow.

Dentistry, pediatric; Children; Census reports; Economics, dental; Demographics; Manpower, dental

Nowak, Arthur J. and Anderson, Jack L.: Preventive dentistry for children: a review from 1968-1988—*Journal of Dentistry for Children. J Dent Child*, 57:31-37, January-February, 1990.

This report summarizes the progress made by pediatric dentistry over the last twenty-year period, especially in terms of prevention, with an emphasis

on the role that the *Journal* has had in informing and guiding the readership along the lines of professional practice. Patients are younger now; parents more informed by the profession and the mass media; practitioners are more prevention-oriented toward disease, as opposed to being trained to control the disease process. A preventive philosophy

continued on page 11



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Order 300 sticks of Extra for \$8.99 (\$21.00 retail) and the canister is FREE.
Make your check payable to the Wm. Wrigley Jr. Company.
Allow up to four weeks for delivery.

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Check flavor: (4106) Peppermint _____ (4101) Spearmint _____ (4107) Bubble Gum _____

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Luride® drops let you adjust dosage to 0.125 (1/8) mg. F.

One study showed that fluoride supplements such as Luride drops and tablets, used daily, prevented caries as effectively as fluoridated water.¹ Luride Drops and Lozi-Tabs have been shown to reduce caries up to 80% when used on a daily basis in non-fluoridated areas.² (Luride DMFS = 1.57, Control = 7.93)

Luride drops are sugar-free and saccharin-free, unlike many fluoride-vitamin combinations. And you can adjust dosage to the nearest 0.125 mg. F—to a single 1/8 mg. drop.

Luride® Lozi-Tabs® tablets: 3 fluoride strengths, 7 kid-pleasing flavors.

For children old enough to chew a tablet or let it dissolve in the mouth, Luride tablets are the logical choice. A variety of delicious fruit flavors (including our unique 4-flavor assorted package) encourages the habit of consistent, continuous use. Three strengths available—1.0 mg. F, 0.5 mg. F, and 0.25 mg F.

LURIDE® BRAND OF SODIUM FLUORIDE DENTAL
 CARIES PREVENTIVE.
 DESCRIPTION and HOW SUPPLIED: All LURIDE systemic fluoride products are free of sugar and saccharin.

Product	Strength (F ion)	Package Size	Flavor
DROPS	Approx. 0.125 mg. per drop	30 ml.	peach
0.25 F TABLETS	0.25 mg. per tablet (quarter-strength)	120	vanilla
0.5 F TABLETS	0.5 mg. per tablet (half-strength)	120 1200*	grape grape
1.0 F TABLETS	1.0 mg. per tablet (full-strength)	120 1000* 5000*	cherry & assorted (cherry, orange, lemon, lime) cherry, assorted cherry
SF 1.0 F TABLETS	1.0 mg. per tablet (full-strength)	120	Special Formula, no artificial flavor or color.

*For dispensing only in quantities containing 120 mg. F. or less.
 CAUTION: Federal (U.S.A.) law prohibits dispensing without prescription.

ADMINISTRATION AND DOSAGE FLEXIBILITY:
 Adjustable dose LURIDE gives you the flexibility to prescribe optimal DAILY dosage (based on age and fluoride content of water).

F-Content of Drinking Water	Daily Dosage (Fluoride Ion)*		
	Birth to Age 2	Age 2-3	Age 3-13
less than 0.3 ppm	0.25 mg. tab or 2 drops	0.5 mg. tab or 4 drops	1.0 mg. tab or 8 drops
0.3 to 0.7 ppm	one-half above dosage		
over 0.7 ppm	Fluoride dietary supplements contraindicated		

*American Dental Association, Accepted Dental Therapeutics, Edition 40 1984, page 401.

PRECAUTIONS: Recommended dosage should not be exceeded since prolonged overdosage may result in dental fluorosis.

REFERENCES:

- (1) Arnold FA, Jr., McClure, F.J., and White, C.L. Sodium fluoride tablets for children. D. Progress 1:8-12, 1960.
- (2) Aasenden, R., and Peebles, T.C. Effects of fluoride supplementation from birth on human deciduous and permanent teeth. Arch. Oral Biol. 19:321-326, 1974; 23:111-115, 1978.

ABSTRACTS Continued from page 7

phy has been presented to the readership in *Journal* volumes 35-55, in which 1,099 scientific articles were published. Prevention (16 percent), oral pathology (24.4 percent), orthodontic/growth and development (14 percent), behavior management (12 percent), and rehabilitative dentistry (9.9 percent) were the largest groups of articles published in the *Journal* in the last two decades.

Oral health; Pediatric dentistry; Dental literature; Prevention; Health promotion; Children

Pinkham, Jimmy R.: Behavioral themes in dentistry for children: 1968-1990. J Dent Child, 57:38-45, January-February, 1989.

In the last twenty years, nearly every aspect of American life has changed, with many serious issues having influence on children. Since the late 1960s these changes have been fast and dramatic. So how dentists will, can, and do manage children has changed during these two decades. Social processes of paradigm shifting and parenting-strategy changes became perceptible in society about the time George Teuscher became editor of the *Journal*; diverse opinions seemed to explode and gain momentum as we watched them become today's realities for professionals, parents and their children. No issue was as pivotal to a successful dentistry-for-children movement in this country as was the ability of dentists to guide and manage the behavior of children through the dental appointment. Approximately 130 articles on behavioral topics have been published during Dr. Teuscher's editorship, a commitment upheld in the area of behavioral sciences in dentistry for children, in a time of society's rapid changes regarding children and their nonparental management.

Pediatric dentistry; Behavior; Management of children; Parenting strategies; Paradigm shifting; Social changes

Fields, Henry W.: Dentofacial growth and development. J Dent Child, 57:46-55, January-February, 1989.

Theoretical growth and development, and practical aspects are explored in an overview of how growth has been considered by investigators and clinicians during the past twenty years, to the beliefs held today. Diagnostic and treatment methods, where technical innovations are the most apparent, are considered in the context of classical orthodontic thinking. New diagnostic techniques will be introduced that will require changes in our basic understanding of growth and treatment. Orthodontics will continue to be integrated into total patient diagnosis and treatment.

Orthodontics; Growth and development, dentofacial

Davis, Martin J.: Restoring the oral health of the child. J Dent Child, 57:56-65, January-February, 1989.

We practice in a country in which 80 percent of oral disease is localized in 20 percent of the children. Restorative care is not about to vanish from the face of the earth, however. Present practice and treatment protocols, and those of the future, are necessarily based on an evolutionary development of restorative dentistry over a period of the last twenty years. The explosion in the use of adhesive technologies and the attention to acceptable esthetics come to the forefront of important developments, as will be the identifying and employing of truly biologically compatible materials. What are also needed are continuing efforts to develop new modalities of restorative care, pulp therapy, and trauma care. Advances in these areas are reviewed; they first appeared in the *Journal* under editor George Teuscher's selecting and publishing for the profession significant articles that advanced dentistry for the child and the adolescent.

Restorative dentistry; Pulp therapy; Trauma care; Caries; Amalgam; Stainless steel crowns; Bonding agents; Morbidity, pulpal; Dentition, primary and mixed; Management techniques; Esthetics, anterior