ASDC AMERICAN SOCIETY OF DENTISTRY FOR CHILDREN

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The eight-year-old is more of a person by adult standards and in terms of adult-child relationships than the seven-year-old. One converses with the eight-year-old with lessening condescension. He is growing up and into a positive outgoing contact with his environment, including his elders. There is a noticeable improvement in the rapidity of his responses and in his perceptiveness of the responses of others.

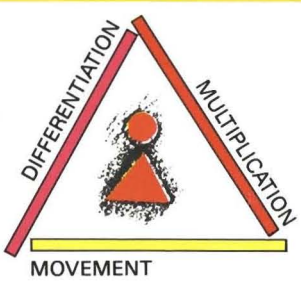
At eight a maturity level is reached where the two sexes are drawing apart. There is a spontaneous segregation, symptomatic of the approach to adolescence and adulthood. And while the eight-year-old is steadily acquiring social aptitudes and insights through acculturation, he is building up an ethical sense, consisting of an intricate aggregate of attitudes.

The feelings of the eight-year-old are easily hurt; he is sensitive to criticism; and he looks for an approving smile, easily misconstruing silences and comments.

Arnold Gesell—1946

CHILDREN HAVE NEITHER PAST NOR FUTURE; THEY ENJOY THE PRESENT, WHICH VERY FEW OF US DO.

—La Bruyère



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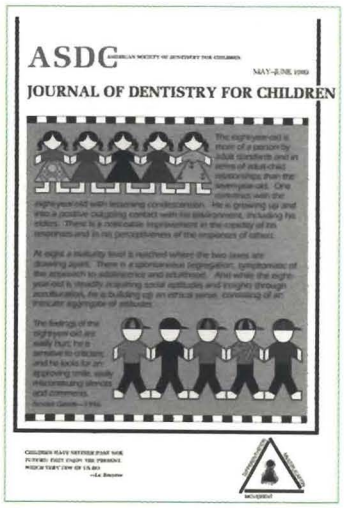

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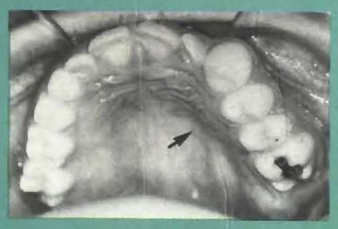

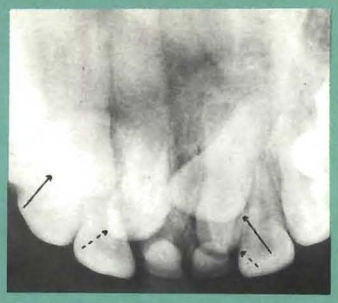

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Marked unilateral overdevelopment of the hard and soft tissues of the head and face is a rare congenital malformation variously described as hemihypertrophy, partial or unilateral gigantism, and hemifacial hyperplasia.

209 The complications of late diagnosis of anterior supernumerary teeth: case report
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Early surgical intervention is preferred, to induce spontaneous eruption of the permanent incisors, prevent anterior space loss, midline shift, and extensive surgical/orthodontic treatment.

212 Familial hypophosphatemic vitamin D-resistant rickets: review of the literature and report of case
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Reports show that familial hypophosphatemia is the most common form of rickets in the U.S. today. The case of a ten-year-old Hispanic girl is reported here.

216 A dental and facial anomaly not previously reported with VACTERL association: report of case
Daniel C. Topper, DDS; Richard D. Fallen, DDS, MD; Randy L Kluender, DDS, MS

The syndrome described as VACTERL includes the following aspects: vertebral, anal, cardiac, tracheal, esophageal, renal and limb.

EPIDEMIOLOGY

220 Dental findings of children with biliary atresia: report of seven cases
Ichijiro Morisake, DDS, PhD; Keiko Abe, DDS; Lily S.M. Tong, BDS; Kazuo Kato, DDS; Shizuo Sobue, DDS, PhD

Congenital biliary atresia (CBA), characterized by obliteration or hypoplasia of one or more components of bile ducts, is a rare disease; of unknown etiology, it occurs once every 25,000 live births.

224 A clinical evaluation of high- and low-fear children in Singapore
Hema Vignehsa, BDS, DPH Dent; Narendra Kumar Chellappah, BDS, LDSRCS, MSc, DDPHRCS; Peter Milgrom, DDS; Robert Going, DDS, MS; Choo Soo Teo, BDS, MSc, DDPHRCS

For the busy reader

Time required for placement of composite versus amalgam restorations—page 177

The Class I permanent molar composite restoration required 35 percent more insertion and finishing time than did the amalgam. The three composite steps of acid-etch, wash and dry, and lightcure accounted for 86 percent of the mean time-differences for the two materials. When multiple teeth in a given quadrant were treated, the time-differences were less than for a single restoration.

Requests for reprints should be directed to Dr. Diane C. Dilley, Associate Professor, Pediatric Dentistry, University of North Carolina, CB #7450, 205 Brauer Hall, Chapel Hill, NC 27599-7450.

A comparison of glass cermet cement and amalgam restorations in primary molars—page 184

GCC is a viable alternative filling material to amalgam in difficult children when short appointments are an important factor. Amalgam, however, has generally better mechanical properties, and should be preferred, therefore, in restorations with occlusal stress.

Requests for reprints should be directed to Dr. Reinhard Hickel, Poliklinik für Zahnerhaltung und Paradontologie, Universität Erlangen-Nurnberg, Glückstr. 11, D-8520 Erlangen, Germany.

Assessing periodontal pathogens in children with varying levels of oral hygiene—page 189

Early detection of the presence of these bacteria and monitoring of their quantitative presence, as treatment progresses, can provide the dental delivery professional with valuable information to aid in selecting the most effective method of treating periodontal disease.

Requests for reprints should be directed to Dr. James Abraham, 625 Guthrie Street, Greensburg, PA 15601.

A litany for change—page 194

If we are to make the best possible case for the continuing and projected needs of children in this country, we must gather and present information designed to bring about a continued awareness of these needs. Data on the numbers of children, poverty, living arrangements, working parents, school enrollments, health care, child abuse, and violence are starting points.

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 11749-8715.

Is there a future for pediatric dentistry? Reviewing the other side of the story—page 198

There is no question that the environment for pediatric dentistry is changing, with a generally improving oral health status for children on the whole and changing delivery patterns of health services. But lost in the presentations of these developments is the proverbial "other side of the story": the general environment within which many children exist; the health services that are needed; the care that is not provided; and the impact of all of this on children.

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 11749-8715.

Craniofacial and intraoral manifestations of congenital hemifacial hyperplasia: report of case—page 203

A 7.7-year-old girl with chief complaints relating to the overlapping of anterior teeth, an occasionally aching jaw, and odontalgia. A diagnosis of hemifacial hyperplasia of the left side was established following a thorough examination and inspection, as well as radiographic

interpretation of the teeth and craniofacial osseous structures.

Requests for reprints should be directed to Dr. Dennis N. Ranalli, University of Pittsburgh, School of Dental Medicine, 362 Salk Hall, Pittsburgh, PA 16261.

The complications of late diagnosis of anterior supernumerary teeth: case report—page 209

The optimal time for surgical intervention, immediate (preferred) and delayed, is controversial. The late diagnosis of anterior supernumerary teeth in a fourteen-year-old Mexican boy is described, including two overretained primary central incisors in the maxillary arch found in the clinical examination. Radiographically, two tuberculate-type supernumerary teeth and two impacted maxillary permanent central incisors were shown. After consultation with the oral surgeon and orthodontist, the patient was referred for further treatment.

Requests for reprints should be directed to Dr. Roberto Solares, Associate Professor, Department of Pediatric Dentistry, School of Dentistry, Universidad Intercontinental, Ave. Insurgentes Sur #4135, Mexico, D.F. 14000, Mexico

Familial hypophosphatemic vitamin D-resistant rickets: review of the literature and report of case—page 212

Early clinical signs of familial hypophosphatemia, the most common form of rickets, usually detected at about two years of age, include lateral bowing of the lower extremities, scoliosis, and frontal bossing. Other signs of rickets are short stature, enlargement of wrists and ankles, and pseudo-fractures, with bony protuberances of the sites of major muscle attachments. The case of a ten-year-old Hispanic girl with multiple carious teeth and dental abscesses is presented.

Requests for reprints should be directed to Dr. Shahrbanoo Fadavi, Dept. of Pediatric Dentistry (M/C 850), College of Dentistry, 801 South Paulina Street, Chicago, IL 60612.

A dental and facial anomaly not previously reported with VACTERL association: report of case—page 216

A case of VACTERL association is presented here in conjunction with possible hemifacial microsomia and fused teeth. Although the etiology of VACTERL association and hemifacial microsomia is unclear, the similarity of symptoms would suggest a common cause.

Requests for reprints should be directed to Dr. Richard D. Zallen, Director of Dentistry and Oral Maxillofacial Surgery, Denver General Hospital, 777 Bannock Street, Denver, CO 80204-4507.

Dental findings of children with biliary atresia: report of seven cases—page 220

These children are subject to various degrees of delayed skeletal and dental development, and intrinsic staining of the teeth and soft tissues with biliverdin, a bile pigment. Very few reports describe the oral and dental manifestations and management of these predisposing conditions to infantile jaundice.

Requests for reprints should be directed to Dr. Ichijiro Morisaki, Dept. of Pedodontics, Asaka University Faculty of Dentistry, 1-8 Yamadaoka, Suita, Osaka 565, Japan.

A clinical evaluation of high- and low-fear children in Singapore—page 224

Relatively little is known about the prevalence or natural history of dental fear in children, in any locale in the world. The rationale for this investigation was the premise that significant levels of fear may increase avoidance and prohibit access to dental care that is free to this population. Moreover, fearful children are more difficult to treat, which can affect quality.

Requests for reprints should be directed to Dr. Peter Milgrom, Dept. of Dental Public Health Sciences, University of Washington, SM-35, Seattle, WA 98195.

Time required for placement of composite versus amalgam restorations

Clinic

Diane C. Dilley, DDS
William F. Vann, Jr., DMD, MS, PhD
Theodore R. Oldenburg, DDS, MS
Roslyn M. Crisp, DDS, MS

Most studies investigating the clinical performance of posterior composite materials have focused on the physical properties of composite resin. Problems with wear resistance and marginal breakdown have led to the development of materials with improved physical properties. Currently, four commercial products have received provisional acceptance and three products have received full acceptance by the American Dental Association's Council on Dental Materials, Instruments, and Equipment (CDMIE).[1] Accordingly, the practitioner may consider composites as an amalgam substitute.

The CDMIE emphasizes that placement of posterior composite restorations demands exacting clinical techniques.[2] Although one could infer that such exacting techniques would require more time than that for amalgam placement, this is speculative, because only one study has examined the time differences for placement of composite versus amalgam for posterior restorations. Hendriks *et al* reported time measurements for 232 posterior composite and amalgam restorations in adults.[3] A total average treatment time of 37 mins for composites was equal to that required for amalgams

Dr. Dilley is an Associate Professor; Dr. Vann is Professor and Chairman; Dr. Oldenburg is a Professor in the Department of Pediatric Dentistry, University of North Carolina, at Chapel Hill. Dr. Crisp is part-time clinical instructor and is in private practice in Burlington, NC.

when an average amalgam polishing time of 11 mins was included in total treatment times. The specific method used for time measurement was not described in the Hendriks' study.

Studies have investigated the placement times for amalgam versus pit and fissure sealants. Dennison *et al* used a stopwatch with direct observation and reported a mean of 6 mins and 20 secs for sealant placement versus 11 mins and 36 secs for amalgam placement without polish and 13 mins and 51 secs with polishing.[4] In a similar study with direct timing, Leverette *et al* reported a mean placement time of 5 mins for a sealant versus 12 mins for a one-surface amalgam without polishing.[5] While these studies address cost-effective issues related to sealants versus amalgams, they are not applicable for comparison of composite versus amalgam restorations.

This study was designed to

- ☐ Develop an indirect method for measuring the time required for restoration placement.
- ☐ Compare the operator-time required for placement of amalgam and composite resins in posterior teeth in children.

The results of the performance of the biomaterials examined in this clinical trial have been reported elsewhere.[6]

METHODS AND MATERIALS

Forty children ranging in age from seven to nine years were selected for participation in this study. Each participant was required

- ☐ To have four permanent first molars erupted sufficiently to retain a rubber dam clamp.
- ☐ To have at least two permanent first molars with Class I decay of the pits and fissures but no decay of the proximal surfaces.
- ☐ To have at least one Class II (and/or Class I) carious lesion in a primary molar.
- ☐ To be mentally and physically healthy so that no special behavior management procedures were anticipated.

Treatment plans were developed based on presence of decay clinically and radiographically at the initial screening appointment. Before restorative sessions were begun, patients were assigned randomly to one of four operators; and in most cases, the child was treated by the same operator throughout the study. Dental materials were assigned randomly to the treatment plans to ensure that both composite and amalgam restorations were placed in each patient. Except when occlusal sealants were indicated, a single restorative material was assigned for all restorations in a given quadrant. Placement of sealants was neither random nor exclusive; rather, sealants were placed in a given quadrant when the operator felt that a sealant was indicated. In some cases only one tooth per quadrant required restorative treatment; in other cases as many as three teeth per quadrant required treatment.

Either amalgam or an experimental resin was used to restore the carious lesions in the primary and permanent molars. The amalgam (Kerr Manufacturing Co.) was a blend of spherical and conventional-cut particles composed of 40 percent silver, 30 percent copper, and 10 percent tin. The experimental resin (H-120, L.D. Caulk/Dentsply) was composed of a barium glass and organic filler at 56.7 percent by weight and 33.4 percent by volume with a filler particle size of 0.04 to 10 microns and a water sorption value of 1.59 mg/cm.^{2} Sealants (Prisma-Shield, L.D. Caulk/Dentsply) were placed in all noncarious permanent first molars.

All restorations and sealants were completed under the rubber dam. For both amalgam and resin restorations, the Class I and II cavity designs were conventional G.V. Black-type preparations without cavosurface bevels. Sealant preparations consisted of rubber cup prophylaxis with a slurry of plain flour of pumice in water.

For the composite cavity preparations, all exposed dentin was covered with a calcium hydroxide base (Dycal, L.D. Caulk/Dentsply). Stainless steel matrix bands were adapted for Class II cavity preparations and wedged interproximally with wooden wedges. The enamel margins of both primary and permanent teeth were etched for 90 secs and 60 secs respectively, with a solution of free phosphoric acid (50 percent by weight). The etchant was rinsed using air-water spray and the tooth was dried thoroughly with air. An unfilled bonding agent supplied by the manufacturer was applied over the etched enamel surfaces, followed by a gentle blast of air to distribute the bonding agent evenly and to prevent pooling. The composite was injected in one increment to fill the cavity preparation using a syringe and compule system supplied by the manufacturer. Amalgam-condensers were used to distribute the composite material into the preparation evenly and an explorer was used to contour the marginal ridge for Class II restorations. The resin was polymerized over the occlusal surface with a visible light (Prisma Lite, LD. Caulk/Dentsply) for 20-60 secs, depending on the thickness of resin material. For a Class II restoration, the wedge and matrix band were removed and the interproximal facial and lingual surfaces were polymerized for 20 secs each. The composite restorations were

Table 1 □ Material insertion and finishing procedural steps and timing guidelines.

Composite			
BA	Base application	START:	Base instrument in operator's hand
		STOP:	Base instrument removed from operator's hand
*MP	Matrix placement	START:	Matrix band placed in operator's hand
		STOP:	Pliers removed from operator's hand after wedge insertion
AE	Acid etch	START:	Brush in operator's hand
		STOP:	Air/water and suction delivered to mouth by dental assistant
WD	Wash and dry	START:	Air/water and suction delivered to mouth by dental assistant
		STOP:	Air/water and suction removed from mouth
BO	Bonding agent application	START:	Brush in operator's hand
		STOP:	Air/water syringe removed from operator's hand
CO	Condensation of resin	START:	Instrument in operator's hand
		STOP:	Final instrument removed from operator's hand
LC	Light cure	START:	Light in operator's hand
		STOP:	Light removed from operator's hand
*MR	Matrix removal	START:	Pliers or scissors in operator's hand
		STOP:	Pliers removed from operator's hand
SM	Smooth and polish	START:	Handpiece in operator's hand
		STOP:	Final instrument removed from operator's hand
Amalgam			
BA	Base application	START:	Base instrument in operator's hand
		STOP:	Base instrument removed from operator's hand
MP	Matrix placement	START:	Matrix band placed in operator's hand
		STOP:	Pliers removed from operator's hand after wedge insertion
CV	Cavity varnish application	START:	Cotton pliers in operator's hand
		STOP:	Cotton pliers removed from operator's hand
CO	Condensation of amalgam	START:	Amalgam carrier in operator's hand
		STOP:	Burnisher removed from operator's hand
CF	Carve and finish	START:	Carver in operator's hand
		STOP:	Last carver removed from operator's hand
MR	Matrix removal	START:	Pliers or scissors in operator's hand
		STOP:	Pliers removed from operator's hand
Sealant			
SP	Pumice tooth	START:	Handpiece placed in operator's hand
		STOP:	Handpiece removed from operator's hand
WD	Wash and dry	START:	Air/water and suction delivered to mouth by dental assistant
		STOP:	Air/water and suction removed from mouth
AE	Acid etch	START:	Brush in operator's hand
		STOP:	Air/water and suction delivered to mouth by dental assistant
WD	Wash and dry	START:	Air/water and suction delivered to mouth by dental assistant
		STOP:	Air/water and suction removed from mouth
SA	Sealant application	START:	Applicator in operator's hand
		STOP:	Applicator removed from operator's hand
LC	Light cure	START:	Light in operator's hand
		STOP:	Light removed from operator's hand

* Indicates matrix placement and removal steps for Class II restorations only

contoured and finished with fluted carbide finishing burs, followed by smoothing and polishing with cups and discs (Quasite-Shofu Dental Co.) with petroleum jelly.

For the amalgam preparations, Dycal was placed as a base in areas of deep caries excavation. Two layers of cavity varnish were applied. Upon completion of amalgam condensation, the material was precarved, burnished with any egg-shaped burnisher, carved with cleoid-discoid carver and explorer, and then burnished with a small burnisher.

Each restorative appointment was videotaped with a ceiling-mounted K-4 closed-circuit JVC KY 2000 (JVC Ltd.) color video camera and a NEC VC9307 (NEC Ltd.) videocassette recorder. The videotaping for each quadrant was initiated with the application of the rubber dam and was terminated when the rubber dam was removed. The camera was focused to view the operating field isolated under the rubber dam and to include the hands of the dentist and the dental assistant, who was the same for all procedures.

Written informed consent was obtained for both the treatment rendered and for the videotaping of each operative appointment.

Following the restorative appointments, each videotape was labelled and stored for viewing and data collection. Ninety-six restorative procedures were reviewed and evaluated for the time necessary to insert and finish the amalgam restorations, resin restorations, and sealants. Restorative procedures were separated operationally into distinct steps, and guidelines were established to determine the initiation and termination of each procedural step (Table 1). By viewing the videotapes, each procedural step was timed manually using

Table 2 ☐ Sample size restoration combinations (excluding sealants).

Total treated during one appointment	Composite n = 73	Amalgam n = 60
	A B	A B
1 CL I	13 (13)	17 (17)
2 CL I	6 (12)	8 (16)
1 CL II	2 (2)	3 (3)
2 CL II	2 (4)	1 (2)
1 CL I and 1 CL II	7 (14)	4 (8)
1 CL I and 2 CL II	1 (3)	7 (21)
2 CL I and 1 CL II	4 (12)	2 (6)

Column A represents the frequency for which a combination of restorations occurred for a given material.

Column B represents the total number of teeth treated for that combination.

Table 3 ☐ Placement time for single class I restorations and sealants in permanent molars.

Material	Sample number	Average total in minutes	Range in minutes
Composite	15	10.13 ± 1.82	7.08 – 12.81
Amalgam	13	7.48 ± 1.85	4.56 – 10.83
Sealant	18	2.94 ± 0.41	2.38 – 3.84

Table 4 ☐ Placement time for two-tooth combinations in permanent and primary molars.

Sample number		Distribution		Average in minutes	
Composite	Amalgam	CL I	CL II	Composite	Amalgam
8	6	2		14.28	7.93
1	2		2	14.59	13.07
4	7	1	1	18.37	12.15

Table 5 ☐ Placement time for three-tooth combinations in permanent and primary molars.

Sample number		Distribution		Average in minutes	
Composite	Amalgam	CL I	CL II	Composite	Amalgam
7	2	1	2	22.34	20.20
2	4	2	1	16.15	14.71

Table 6 ☐ Average time in minutes per step for Class I permanent molars.

Composite (n = 15)		Amalgam (n = 13)		Sealant (n = 18)	
BA	0.93	BA	0.22		
AE	1.22			AE	1.10
WD	0.32			SW	0.30
BO	0.42	CV	0.78		
CO	1.98	CO	2.49	SA	0.66
LC	0.73			LC	0.43
SM	4.48	CF	3.98		

AE	Acid etch	LC	Light cure
BA	Base application	SA	Sealant application
BO	Bonding agent	SM	Smooth and polish
CF	Carve and finish	SP	Pumice
CO	Condense	SW	Sealant wash
CV	Cavity varnish	WD	Wash and dry

Table 7 ☐ Time in minutes for Class I permanent molars with and without base.

	Composite (Base)	Amalgam (Base)	Amalgam (No base)	Sealant (No base)
Sample size	15	7	6	18
Number of procedural steps	7	4	3	6
Total time	10.09	7.82	7.08	2.94
Average time per step	1.44	1.95	2.36	0.49
Average time base step	0.93	0.40	0	0

Table 8 ☐ Operator times in minutes for Class 1 restorations in permanent molars.

Operator	#1	#2	#3	#4*
Amalgam				
Sample number	3	2	0	8
Mean	5.56	4.92	0	4.78
Composite				
Sample number	3	1	2	11
Mean	10.44	7.37	12.27	9.83
Sealant				
Sample number	5	5	1	7
Mean	2.93	2.66	3.44	3.08

* Operator #4 was inexperienced in placement of posterior composites.

a Meylan #208 (Meylan, NY, NY) stopwatch measured in hundredths of minutes. Initially, all times were recorded by two raters. After high interrater reliability was established, one rater completed the remaining measurements. Intraexaminer reliability was monitored and maintained by random repeated measurements. When a second measurement differed greater than 10/100th mins, a third measurement was made and the mean of the three values utilized.

RESULTS

Ninety-six operative appointments were videotaped for placement of 133 restorations and eighteen sealants. Table 2 represents a breakdown of Class I and Class II restorations treated alone and in combinations. Although a sample size of sixty amalgam and seventy-three composite restorations is reasonable, it was not possible to separate primary from permanent teeth where multiple restorations were filled and finished at one time. In other words, when restorations were broken down into individual cells for comparisons, the sample sizes were inadequate for sophisticated statistical analysis. A descriptive analysis of the recorded combinations, therefore, is reported.

There were forty-six single Class I restorations and sealants placed in permanent molars, of which fifteen were composites, thirteen were amalgams, and eigh-

teen were sealants. The overall mean insertion and finishing time was 10.13 mins for composite, 7.48 mins for amalgam, and 2.94 mins for sealants (Table 3). The difference of 2.65 mins for a Class I composite and amalgam indicated that 35 percent more time was required for composite insertion and finishing. The time differences for the sealant and the restorative materials revealed that a Class I composite required greater than 250 percent more time and a Class I amalgam required greater than 150 percent more time than the sealant.

When multiple teeth were restored in a quadrant, a combination included a permanent molar with one or more primary teeth. In such instances, the composite restorations required more overall placement time than the amalgam restorations (Tables 4, 5). The mean insertion and finishing time for a Class I restoration in a permanent and a primary molar was 14.28 mins for composite and 7.93 mins for amalgam. The difference of 6.35 mins represents 80 percent more time required to insert and finish two Class I composites compared to two Class I amalgams. For two Class II restorations with 14.59 mins for composite and 13.07 mins for amalgam, the mean difference of 1.52 mins represents only 11.6 percent greater time required for composite compared to amalgam. When a Class I restoration in a primary or permanent molar was combined with a Class II restoration in a primary molar, the time comparison was 18.37 mins for composite and 12.15 mins for amalgam. This 6.22 mins mean time-difference represents 51 percent more time required for composite than for amalgam restorations.

Three tooth combinations also showed greater times for composite compared to amalgam (Table 5). When one Class I permanent tooth restoration and two Class II primary tooth restorations were completed simultaneously, the mean time-difference was 2.14 mins, a 10.6 percent greater time-difference for the composites. Three tooth combinations of two Class I (one each primary and permanent molar) restorations with one Class II primary tooth restoration showed a 1.44 mins difference or 9.8 percent greater time for the composites.

DISCUSSION

Our results reveal a clear trend for the placement time of posterior composite restorations to be greater than that for amalgam. This greater time required for insertion and finishing of a composite can be accounted for by the differences in its handling properties when compared to amalgam. An analysis of the various procedural steps required for the placement of each material helps to identify the source of these differences. The total of seven steps required by the Class I composite was greater than the four steps required for the amalgam and the sealant (Table 6). As a result, the average time required for each amalgam procedural step was slightly greater than for the composite. The three additional steps required for the composite (acid etch, wash and dry, and light-cure) however, totaled 2.27 mins. This accounted for 86 percent of the mean time difference between the composite and amalgam.

The placement of a calcium hydroxide base was chosen for direct comparison, because its use was optional for the amalgam and was operator-determined, according to the condition of the tooth upon removal of decay. Conversely, a base was placed for all composites for pulp protection of exposed dentin surfaces before acid-etching. Table 7 illustrates the mean base step of 0.93 mins for composite to be two times greater than the 0.40 mins required for the amalgam. This difference is probably related to the greater time needed to cover

It required 80 percent more time (6.35 minutes) to insert and finish two Class I composites compared to Class I amalgam restorations.

all exposed dentin surfaces for composite, as opposed to limiting placement of a base to areas of deep excavation for amalgam.

There were two procedural steps requiring a greater amount of time for the amalgam. The application of the amalgam cavity varnish took 0.78 mins (Table 6), nearly twice the time measured for the application for the composite bonding agent at 0.42 mins. This was due to the fact that two layers of cavity varnish were applied with air-drying between the two, while only a single application of bonding agent was necessary. Differences were also noted in the condensation times, with the amalgam taking 0.51 mins longer than the composite. This resulted because the amalgam was inserted and condensed incrementally, compared to the bulk insertion by the compule system for the composite.

The total time requirements for two- and three-tooth combinations supported the findings that the composite required more placement time than the amalgam. Although sample sizes were small, some observations from Tables 3 and 4 can be made. For two Class I restorations, composites required an average of 4.15 mins or 41 percent more time than for one Class I composite restoration. The average time for two Class I amalgam restorations required only 0.45 mins or 6 percent more time, however, than for one Class I restoration. Two Class II composites required 1.52 mins or 11.5 percent more time to insert and finish, when compared to two Class II amalgams; but the total sample size was only one quadrant for the composite and two quadrants for the amalgam. When one Class I and one Class II restorations were completed, the composites required 6.22 mins or 51 percent greater amount of time than the amalgam. For quadrants with three-tooth combinations (Table 5), one Class I and two Class II composites required only 2.14 mins or 10.6 percent greater amount of time than the amalgam. Similarly, two Class I and one Class II composites required only 1.44 mins or 9.8 percent greater amount of time than the amalgam.

Acknowledging that the sample sizes were small for two- and three-tooth combinations and that the preparations were not identical, trends showed that time differences decreased when multiple teeth were treated in a given quadrant. This supports the clinical impression that treatment can be delivered more efficiently, when more than one tooth is treated simultaneously.

In this study an average of 2.94 mins (range 2.38-3.84 mins) for a sealant is less than the 6.34 mins reported by Dennison *et al* and less than the 5 mins reported by Leverette *et al*.[4,5] The decreased time required for sealant application in the present study can be attributed to the fact that timing did not begin until after rubber dam isolation was completed. Furthermore, sealant procedures were timed according to specific criteria, identifying the beginning and the end of each procedural step and any time spans between steps were not included in the total.

The average composite time of 10.13 mins and amalgam time of 7.48 mins were considerably less than the 37 mins average for both composite and amalgam that Hendriks *et al* reported.[3] By deducting the 10 mins average for amalgam and composite tooth preparation and the 11 mins average for amalgam polishing, in the Hendriks study, the resultant 27 mins for composites and 16 mins for amalgam show a significant time difference for the two materials. The overall greater timing averages in the Hendriks study may have been related to variances in timing methodologies in addition to consolidation of averages for one-, two-, and three-surface restorations.

Operator effect was evaluated for comparisons in placement time (Table 8). Differences between operators for treatment of Class I permanent molars were considered minimal, especially in view of the small sample size. Three of the four operators were considered experienced, because each had participated in previous posterior composite studies, while operator #4 (Table 8) had never placed a posterior composite prior to this study. Analysis of the data revealed no time differences regarding operator experience with posterior composite procedures.

Establishing specific guidelines for timing of procedural steps in combination with videotape playback was found to be a highly reproducible method for chronographic assessment of dental procedures. To reduce the factor of human error by manually timing with a stopwatch, we recommend that future research utilize a time-event imprint on the videotape to increase accuracy.

Timing results reported here for the composite restorations are technique-specific and any procedural changes will directly affect timing-outcome. Since the initiation of this study, more complex composite insertion and finishing techniques have been introduced to improve the physical properties of composites. Procedural differences directly affecting timing include application of glass ionomer cement bases, use of transparent matrices with reflecting cores in light wedges, the incremental material insertion and light-cure technique, and varying abrasive finishing techniques.[7-19]

A major objective of this study was to develop a methodology to measure treatment-time-differences with

two dental materials. To provide treatment in a reasonable amount of time and in the manner that is the accepted standard of contemporary dental practice, quadrant dentistry was delivered. This made it impossible to desegregate such variables as maxillary versus mandibular quadrant, primary versus permanent teeth, Class I versus Class II preparation, or occlusal in combinations with occlusolingual, or facial and lingual pits. To achieve specific individual cells of sufficient size for statistical analysis of such variables, it would have been necessary to have a sample of hundreds or perhaps thousands of child patients.

CONCLUSIONS

The Class I permanent molar composite restoration required 35 percent more insertion and finishing time than did the amalgam. The three composite steps of acid-etch, wash and dry, and light-cure accounted for 86 percent of the mean time-differences for the two materials. When multiple teeth in a given quadrant were treated, the time-differences were less than for a single restoration.

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VALUE OF ORTHODONTIC TREATMENT

Traditionally orthodontists have assumed a mainly utilitarian motive for their work—that orthodontic treatment enhances dental health and function, and as such assures greater longevity of the dentition. There is, however, a disappointing lack of evidence for these aspirations and the disadvantages of malocclusion from the dental health and functional view-point appear rather modest. Early correction of prominent incisors certainly may reduce the risk of trauma: the potential benefit becomes less with age but it should not be forgotten that there is also some association between excessive overjet and pathological migration of the incisors in adulthood. Avoidance of pathological changes that may attend tooth impaction (especially of wisdom teeth) is clearly desirable. Of other variations in alignment, only the extreme, such as deep overbite and gross displacement of individual teeth, are likely to be true risks to dental health. Links between most occlusal variations and dental caries, periodontal disease and mandibular dysfunction are weak, so that in recent years greater emphasis has been placed upon the role of orthodontics in enhancing social and psychological well-being through improvement in appearance.

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A comparison of glass cermet cement and amalgam restorations in primary molars

Reinhard Hickel, Pr.-Dozent, Dr
Axel Voss, Pr.-Dozent, Dr

The duration and success rate of amalgam restorations are much less satisfactory in children than in adolescents and adults. Especially in little children, the failure rate is very high.[1-4] In order to avoid general anesthesia or nitrous oxide analgesia in the treatment of difficult children, short appointments become an important factor. We found also that the use of the rubber dam frequently overtaxes the ability of the young patient to cooperate. Hence contamination with moisture (blood and saliva) during the insertion of the amalgam results in a restoration of inferior quality and durability.

Glass ionomer cements, sometimes called glass polyalkenoate cements (GPC's), were recommended as filling material in primary molars.[5-11] Their advantage lies in their continuous release of fluoride and in their ability to adhere to mineralized tooth tissue. But these cements are brittle and the flexural and compressive strengths are much weaker than those of amalgam.

In recent years glass cermet cement (GCC) has been proposed for primary molars.[12-16] GCC is metal-reinforced GPC and should have better properties than traditional GPC: less occlusal wear, greater flexural strength, improved radiopacity and faster setting reaction.

The aim of this clinical study is to compare the efficacy of GCC with amalgam as a filling material in primary molars.

Dr. Reinhard Hickel and Dr. Axel Voss are on the faculty of the dental school, University of Erlangen-Nurenberg, Germany.

MATERIALS AND METHODS

Two hundred and fifteen restorations were placed in first and second primary molars of seventy-four patients with an age-range from four to ten years. The materials were Ketac-Silver™ (ESPE, Seefeld, West Germany) an encapsulated GCC, and Amalcap SAS™ (Vivadent, Schaan, Liechtenstein), an encapsulated nongamma-2 amalgam. Distribution of Class I and Class II restorations were similar among both materials and all age-groups. In split-mouth mode, thirty-seven pairs of GCC and amalgam were placed (Tables 1 and 2).

To exclude the influence of isolation technique, only restorations placed without rubber dam were evaluated. All Class II restorations were placed with a matrix and a wedge interproximally and teeth were isolated with cotton rolls.

In most cases cavity sizes were small (mo or od), but their distribution was similar for both materials. With regard to the mechanical properties, cavity preparation techniques in amalgam and GCC were different. In amalgam restorations the cavity was prepared as usual. Because GCC is known to be much weaker and to have less flexural and tensile strength, narrow isthmuses and keyways were avoided. Because the chemical adhesion of GCC is not sufficient, the proximal cavity has to have its own resistance and retention form by the use of small undercuts.

Table 1 ☐ Distribution of cavity size and filling material.

Restorations (n)	Class I	Class II	total
GCC	49	76	125
Amalgam	34	56	90
Total	83	132	215

Table 2 ☐ Distribution of the patient's age and filling material.

Age-group (years)	GCC n	GCC %	AM n	AM %	total n	total %
4–5.9	39	31.2	28	31.1	67	31.2
6–7.9	44	35.2	33	36.7	77	35.8
8–10	42	33.6	29	32.2	71	33.0
total	125	100	90	100	215	100

Table 3 ☐ Rating system: Score 1 and 2 represent acceptable restorations; score 3 and 4 restorations have to be replaced.

Marginal integrity
- 1 sharp explorer will not penetrate
- 2 sharp explorer will penetrate, but no dentin or base is exposed
- 3 dentin or base is exposed
- 4 restoration is mobile or fractured, tooth structure is fractured, caries

Anatomical form
- 1 contour is continuous
- 2 slightly under-, overcontoured, occlusal height reduced locally
- 3 under-, overcontoured, dentin or base exposed, occlusion affected
- 4 defects (partial loss), restoration is missing

Cumulative rating system for restoration
- 1 excellent
- 2 satisfactory
- 3 not acceptable
- 4 replace immediately

GCC was triturated at high speed for 10 sec and inserted by syringe from the capsule directly into the cavity, adapted with a cement plugger, and coated with a varnish or resin bonding agent. The cavity was overfilled, so the contaminated layers could be removed. After five to eight minutes the restoration was trimmed and finished with the appropriate diamond finishing instruments and polishing discs, using a copious waterspray. Small amounts of excess material on the occlusal margin were later removed and the restoration finished (not before twenty-four hours, usually at the next appointment).

The children were called in at intervals of six months, using a rating system for restorations according to Ryge 1980 (Table 3).[17] Scores 1 and 2 represent acceptable restorations; fillings assigned a score of 3 or 4 were replaced. If a primary molar had been exfoliated, time and status at the last examination were used.

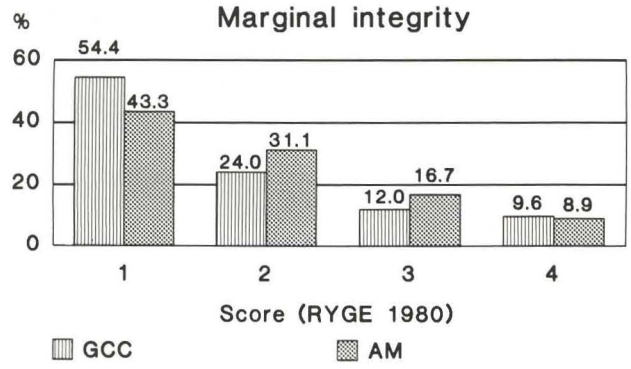


Figure 1. Cross-tabulation chi-square marginal integrity (acceptable/replace) by material (GCC/AM): n.s. P = 0.29. GCC showed slight advantages in marginal integrity.

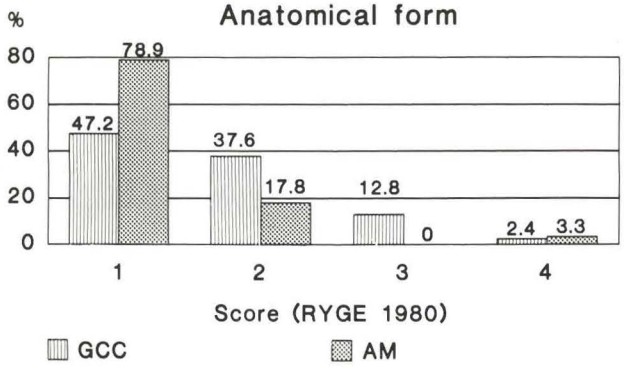


Figure 2. Cross-tabulation chi-square anatomical form (acceptable/replace) by material (GCC/AM): P = 0.0046. GCC had significantly poorer results in anatomical form.

RESULTS

The average age of GCC restorations was 2.5 years, of amalgam 2.6 years, and the maximum age of both materials 4.4 years. There were no pulpal involvements over the total observation time.

While GCC did have slight advantages in marginal integrity, the loss of anatomical form was significantly greater than in amalgam (Figures 1 and 2). In large cavities amalgam showed better results (Figure 3). The overall failure rate was not significantly different (Figure 4).

The cumulative failure survival curves (Kaplan-Meier) of GCC and amalgam were also not significantly different (Figures 5 a-d, and Table 4).

In the age-group 4 to 5.9 years, both materials showed significantly poorer results compared with restorations in older children (log-Rank-test P < 0.0001). In young children GCC showed slightly better results; in contrast, in older patients, amalgam is superior (Table 5). Regarding the success rate no difference exists between D and E (data not shown).

Table 4 ☐ P-Values of the Log-Rank-Test (AM = amalgam, GCC = glass cermet cement).

GCC Class I/GCC Class II	0.051 n.s.
Am Class I/AM Class II	0.141 n.s.
GCC Class II/AM Class II	0.432 n.s.
GCC Class I/AM Class I	0.664 n.s.

DISCUSSION

Mechanical properties like occlusal wear, flexural and tensile strengths of amalgam restorations are known to be much better than those of GCC. Hence, as would be expected, GCC showed significantly more abrasion and loss of anatomical form. Often small air bubbles caused by trituration were exposed under wear. In permanent teeth, therefore, GCC is not recommended, because of its high failure rate.[18]

In permanent teeth, glass cermet cement is not recommended.

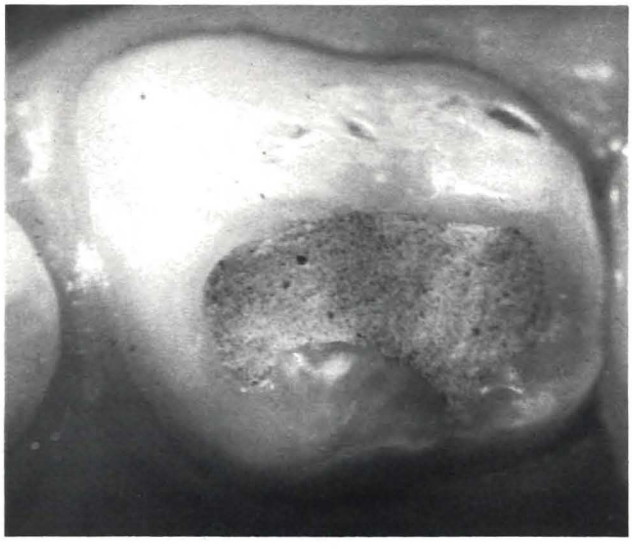
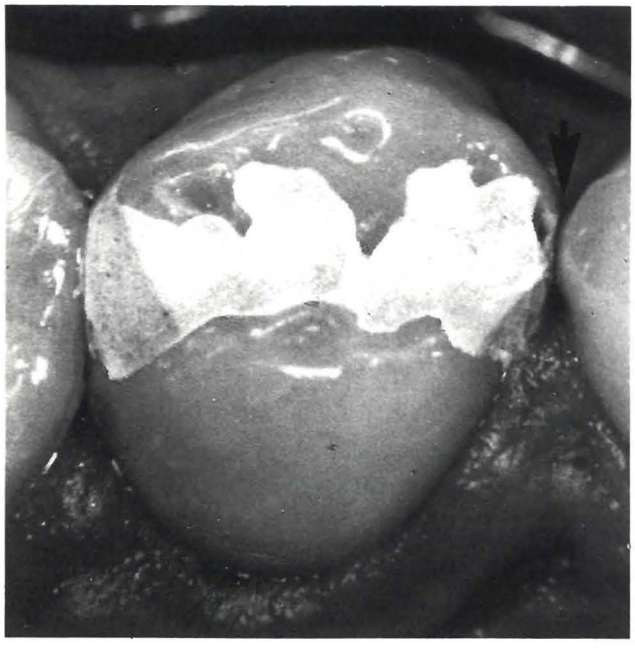


Figure 3a, above. The GCC restoration is 3.2 years old, on the occlusal surface pores are exposed by wear.

Figure 3b below. A small defect in the mesial part of the restoration was noticed after 1.5 months.



Requirements for restorations in primary molars, as distinguished from permanent teeth, are as follows:

- ☐ *Limited duration until exfoliation:* The intention in restoring primary molars is to conserve these teeth for a few years until physiological exfoliation occurs and thus reduce the need for orthodontic therapy, and assure and sustain the health of the oral tissues during childhood.
- ☐ *Higher occlusal abrasion of primary teeth:* From this perspective lower occlusal wear of GCC restorations may be acceptable. Loss of anatomical form (abrasion) does not involve marginal integrity. In certain cases, occlusal wear in primary teeth is followed by marginal exposure of an amalgam restoration, which is assessed as loss of anatomical form.

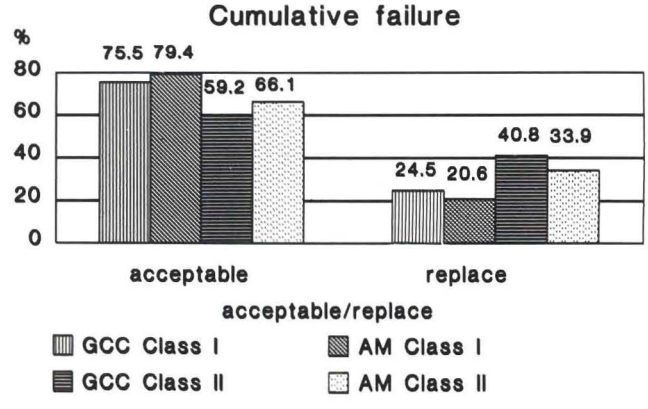
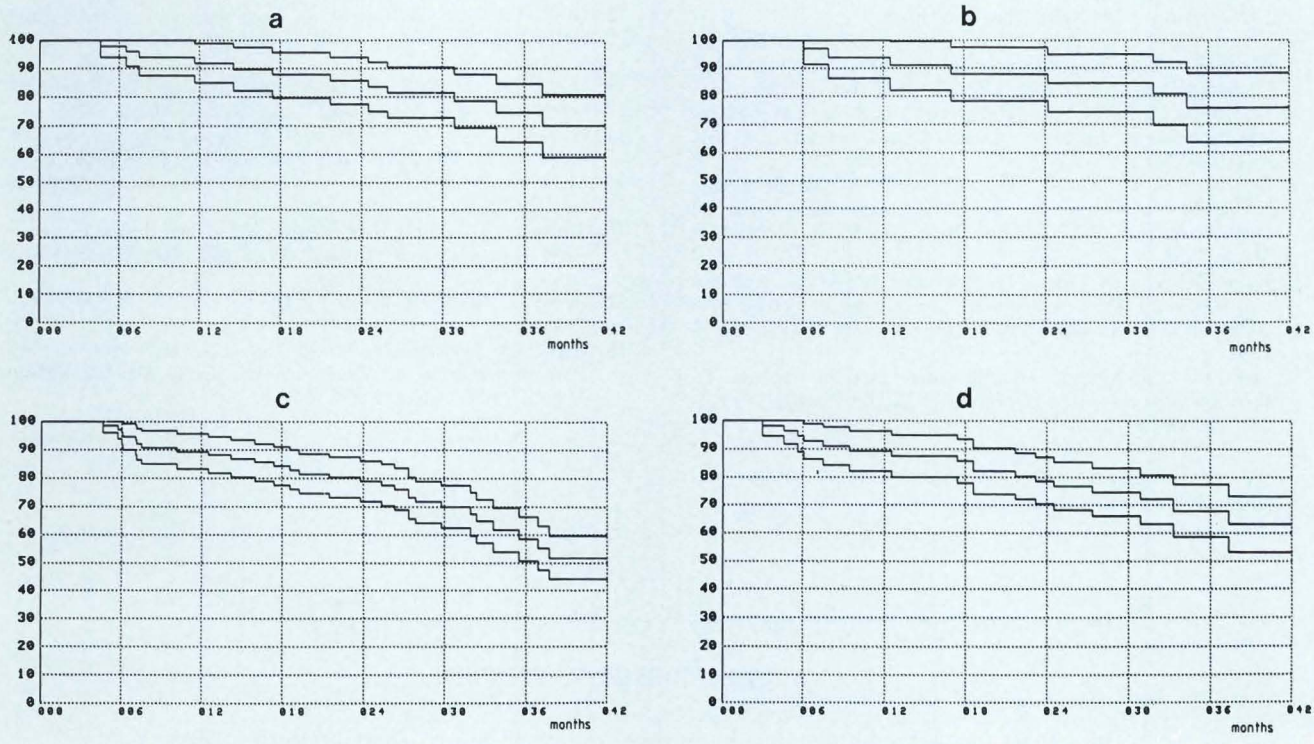


Figure 4. Regarding the cumulative failure rate, amalgam showed slightly better results, but not significantly different: cross-tabulation chi-square cumulative failure (acceptable/replace) by material (GCC/AM): P = 0.39.

Figure 5 a-d. The survival curves (Kaplan-Meier) of GCC Class I (a), amalgam Class I (b), GCC Class II (c) and amalgam Class II (d). The three lines represent the mean and the standard deviation.



- ☐ *Higher failure rate of restorations:* In young and/or difficult children amalgam often cannot be placed under optimal conditions and, therefore, results are less favorable.
- ☐ *Gaining time until a proper filling is accepted by the child:* In older children, because of their greater maturity, it will be often possible to replace insufficient GCC-restorations with amalgam. The treatment will be easier and the quality higher.

Objectivity is the key in deciding whether a restoration is acceptable or has to be replaced. The overall failure rate of amalgam is lower than that of GCC, but not significantly different. In older children, amalgam has greater advantages.

An advantage of GCC is the short time required to fill the cavity. This might be an important factor in young and/or difficult children. In these cases amalgam cannot be placed under optimal conditions and, therefore, the results are less satisfactory.

Table 5 ☐ Survival rate related to 2-year age-groups (age of the patients at the beginning of treatment). The age-groups had similar distributions of Class I and Class II restorations. The first age-group (4-5.9 years) had significantly poorer results compared with the other age-groups (Log-Rank-test P = 0.0001).

Age of the patient	GCC				AM			
	total	replace		survival 2-years	total	replace		survival 2-years
	n	n	%		n	n	%	
4–5.9	39	17	43.6	64.0%	28	14	50.0	56.0%
6–7.9	44	14	31.8	88.6%	33	7	21.2	90.9%
8–10	42	10	23.8	90.5%	29	5	17.2	96.6%

CONCLUSION

GCC is a viable alternative filling material to amalgam in difficult children, when short appointments are an important factor. Amalgam, however, has generally better mechanical properties, and should be preferred, therefore, in restorations with occlusal stress.

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SO-CALLED PRISMLESS ENAMEL

The surface enamel of human deciduous teeth showing a more negative birefringence by polarized light was investigated by differential interference contrast microscopy and by scanning electron miscroscopy (SEM) following EDTA etching. Though this surface enamel has been generally called the 'prismless' enamel, in this study, the so-called 'prismless' enamel was categorized into 'false', 'moderate', 'essential' and 'complex' types according to whether they took the form of distinct prisms which bended at the subsurface, indistinct circularly based prisms or not. Based on the SEM observations some types of the 'prismless' enamel showed parallel crystallites and no prism boundaries. However, if indistinct prisms showing centripetal crystallites within the circular boundaries are admitted into the prismless enamel, other types except the 'false' ones will generally belong to it.

Kodaka, T. *et al*: Structure of the so-called "prismless" enamel in human deciduous teeth.
Caries Res, 23:290–296, September-October 1989.

Assessing periodontal pathogens in children with varying levels of oral hygiene

James Abraham, DMD
H.M. Stiles, DDS, PhD, MPH
Lisa A. Kammerman, PhD
Donald Forrester, DDS, MSD

Periodontal disease, like dental caries, is considered to have an infectious etiologic component, and a physical/mechanical component in the accumulation of plaque around the gingival margin at the cervix of the tooth. The typical manifestations of periodontal disease, tissue inflammation and eventual loss of gingival tissue and alveolar bone, are the subject of intense research investigation, though few studies have investigated periodontal disease in children, in particular its diagnosis and treatment.

At present, four types of periodontitis have been identified: Prepubertal, Juvenile, Rapidly Progressive, and Adult.[1] Case reports by several investigators have suggested that many forms of periodontal disease may begin in the primary and transitional (mixed) dentition.[2-4] Periodontal disease becomes more prevalent from early childhood to the ages of fourteen or fifteen years, with an increase again evident at the ages of fifteen to nineteen years.[5]

Dr. Abraham is Pediatric Dental Fellow at Children's Hospital National Medical Center, Washington, D.C. Dr. Stiles is Executive Secretary, Epidemiology and Disease Control Study Section, Division of Research Grants at the National Institutes of Health, Bethesda, MD. Dr. Kammerman is Biostatistician at Children's Hospital National Medical Center, Washington, D.C. and Assistant Professor at the Department of Child Health and Development, the George Washington University School of Medicine and Health Sciences, Washington, D.C. Dr. Forrester is Chairman, Department of Pediatric Dentistry, Children's Hospital National Medical Center, Washington, D.C.

The strong association between periodontal disease and age is generally considered to be the result of prolonged exposure to the acids and toxins produced by bacterial plaque. Due to the chronic nature of this disease, as well as its rapid progression, evidence of a strong association with increasing age suggests that detection and treatment must be instituted during childhood and adolescence.[5]

Current studies (Tanner *et al* 1979); Okuda *et al* 1984; Mandell *et al* 1987) support the concept that three major organisms are primary contributing factors in the development of periodontal disease in children.[6-8] These organisms are *Actinobacillus actinomycetecomitans, Bacteroides gingivalis*, and *Bacteroides intermedius*. While other factors may influence periodontal disease, these bacteria contribute significantly as causative agents of the disease.[9-11] These organisms are considered to be exogenous pathogens which are found regularly in sites of periodontal disease, and not in normal human subgingival flora.

Early detection of the presence of these bacteria and monitoring of their quantitative presence, as treatment progresses, can provide the dental delivery professional with valuable information to aid in selecting the most effective method of treatment.[12]

Use of DNA probe technology has the potential for aiding in the diagnosis of the various forms of periodontal disease, and for identifying specific sites undergoing active tissue destruction. The probe may

also be used to monitor the effectiveness of periodontal therapy and the evaluation of microbial flora in refractory cases of periodontal disease. In addition, infection may be detected prior to recurrence, or prior to an initial onset of periodontal disease.[12] Although the DNA probe has been effective in detecting these three organisms in adults, there have been no studies documenting the effectiveness of the DNA probe in identifying the presence of these organisms in children.[13]

The purpose of this study was to determine the presence of *A. actinomycetecomitans, B. intermedius*, and *B. gingivalis* in children by means of quantitative analysis for maxillary and mandibular first permanent molars.

MATERIALS AND METHODS

Fifty-three children, thirty-one males and twenty-two females, from Children's Hospital National Medical Center, Washington, D.C. Department of Pediatric Dentistry were selected for the study. Their ages ranged between six and fourteen years with a mean age of 9.4. The study sample comprised ten Caucasians, thirty-five Blacks and eight Hispanics.

All patients were required to meet the following predetermined criteria in order to be included in this study:

- ☐ Presence of permanent first molars (maxillary and mandibular).
- ☐ No antibiotics taken for the previous two months.

Informed consent was obtained from all patients and legal guardians.

A Modified Plaque Index (modification from Green and Vermillion, 1964) was obtained for each patient.[14] The plaque from patients was recognized by passing a periodontal probe across all tooth surfaces. The Modified Plaque Index (MPI) score, which ranges from 0-3, denotes the clinical presence and severity of the plaque. The following scores were assigned for each patient:

0: No plaque in the gingival area.

1: Slight amount of plaque adhering to the tooth and gingival margin.

2: Moderate amounts of plaque around the neck of the tooth and gingiva.

3: Gross accumulation of plaque around the neck of the tooth and gingiva.

The supragingival plaque was removed from the gingival margin coronally, with a sterile periodontal curette, to avoid pushing supragingival plaque into the gingival crevice. Subgingival plaque samples were then collected from the anterior (mesial) surface of the mandibular and maxillary right and left first permanent molars present. The site to be sampled was isolated with cotton rolls and dried. The supragingival plaque was removed from the gingival margin coronally, with a sterile periodontal curette, to avoid pushing supragingival plaque into the gingival crevice. A paper point was inserted into the mesial surface of each first permanent molar, using college pliers and directed so the tip of the paper point was in the deepest portion of the gingival crevice directly underneath the tooth's contact point. The paper points were left in place for ten seconds. They were then removed and placed in the sample collection vial, one paper point per vial. No holding medium is necessary for the collection vial. Because DNA is stable in a dry state, it is less sensitive to transportation methods than other laboratory tests. Each vial was labeled with the patient's identification number, sample site, and date of sampling.

A total of 200 samples from 212 sites was obtained from the crevicular area of the mesial surface of all first permanent molars present. Three subjects were omitted because of incomplete data. All samples were submitted to NIDR for laboratory analysis for the presence of these organisms. Sensitivity of the DNA probe was 10^3 organism or greater.

LABORATORY ANALYSIS

From each sample site, the incidence of positive probes will be measured as *not detectable, positive* or *high positive*.

- ☐ *Not detectable* represents levels of pathogen less than 10^3 microorganisms.
- ☐ *Positive* represents levels of pathogen from 10^3 microorganisms.
- ☐ *High positive* represents levels of pathogen of 10^5 microorganisms and greater.[11,14]

Statistical analysis

For purposes of data analysis, patients' sites were categorized into two groups: MPI = 0 and MPI ≥ 1. Demographic characteristics (age, sex, race) of the two MPI groups of patients were compared using a t-test for age, and chi-square tests for sex and for race.

Distribution of sites harboring the organisms, alone or in combination, were constructed for each MPI group. Because each study patient contributed four sample sites, the sites could not be considered independent. No statistical tests were performed, therefore, because the univariate tests that are seemingly appropriate for these data would violate underlying assumptions. Graphic displays and other descriptive statistics, however, were produced.

Results

SITE-LEVEL RESULTS

There were fifty-three patients, thirty-one males and twenty-two females, in the study sample. Three patients were omitted from the study because of incomplete data. Among the remaining fifty patients, the average age was 9.4 years (range six to fourteen years). Fourteen patients had a MPI = 0 and thirty-six patients had a MPI ≥ 1. The race (p = .453) and age distributions (p = .51) were similar among the two groups. The sex distributions, however, differed (p = .041); the MPI = 0 group comprised 38.5 percent males, while the MPI ≥ 1 group comprised 65.7 percent males.

Sample sites (N = 200), from fifty patients who had at least one site in which one or all their bacteria were detected were investigated. Of the total number of sample sites, fifty-nine sites (30 percent) belonged to the group MPI = 0 and 141 sample sites (70 percent) belonged to the group MPI ≥ 1.

The number (percent) of sites having *A. actinomycetecomitans, B. intermedius, B. gingivalis* alone or in combination for subjects with a MPI = 0 and a MPI ≥ 1 is summarized in Table 1, Figure. Among 200 sample sites, *B. gingivalis* was never detected alone. For the group MPI = 0, in thirty-three sample sites (55.9 percent) none of the three bacteria was detected. Among patients with a MPI ≥ 1, *A. actinomycetecomitans* alone was detected in 3.5 percent of the sites. A higher percentage (19.7 percent) of the combination *B. intermedius* and *B. gingivalis* was detected in the group MPI ≥ 1 than for the group MPI = 0 (13.6 percent). A large difference was observed between the two groups when all three organisms were found in combination: only four sample sites (6.8 percent) for the group MPI = 0 and 32 sample sites (22.7 percent) for the MPI group ≥ 1.

Table 1 ☐ Distribution of sites (200) by Modified Plaque Index for microorganisms individually or in combination.

Microorganism or combination	Modified Plaque Index 0	>1	Total
No Bacteria	33 (55.9%)	49 (34.8%)	82 (41.0%)
1* A.a. only	0	5 (3.5%)	5 (2.5%)
2* B.i. only	14 (23.7%)	23 (16.3%)	37 (18.5%)
3* B.g. only	0	0	0
A.a. + B.i.	0	5 (3.5%)	5 (2.5%)
A.a. + B.g.	0	0	0
B.i. + B.g.	8 (13.6%)	27 (19.7%)	35 (17.5%)
A.a. + B.i. + B.g.	4 (6.8%)	32 (22.7%)	36 (18.0%)
Totals	59 (100%)	141 (100%)	200 (100%)

1* A.a. Actinobacillus actinomycetecomitans
2* B.i. Bacteroides intermedius
3* B.g. Bacteroides gingivalis

Table 2 ☐ Distribution of sites by Modified Disease Index and type of microorganism.

Microorganism	Present	Modified Plaque Index 0	>1	Total
1* A.a.	No	55 (93.2%)	99 (70.2%)	154 (77.0%)
	Yes	4 (6.8%)	42 (29.8%)	46 (23.0%)
2* B.i.	No	33 (56.0%)	54 (38.3%)	87 (43.5%)
	Yes	26 (44.0%)	87 (61.7%)	113 (56.5%)
3* B.g.	No	47 (79.6%)	82 (58.2%)	129 (64.5%)
	Yes	12 (20.4%)	59 (41.8%)	71 (35.5%)

1* A.a. Actinobacillus actinomycetecomitans
2* B.i. Bacteroides intermedius
3* B.g. Bacteroides gingivalis

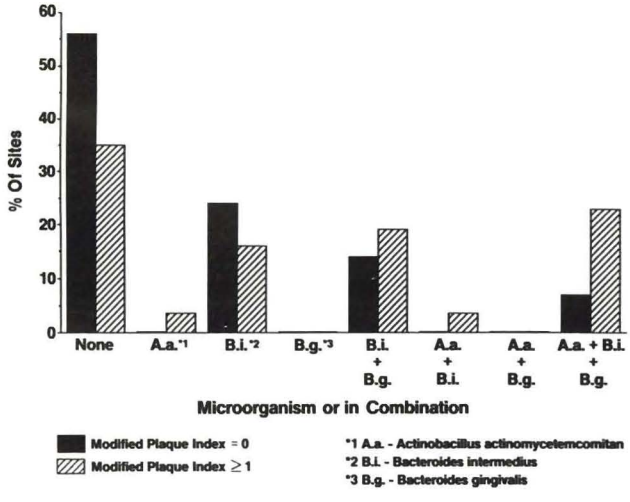

Figure. Number (percent) of sites (N = 200) having A.a., B.i., B.g. alone or in combination.

The number and percentage of sites with or without the microorganisms, and the number and percentage of sites arranged by the Modified Plaque Index are summarized in Table 2. From the fifty-nine sites of the group MPI = 0, four sites (6.8 percent) revealed *A. actinomycetecomitans* only, twenty-six (44.0 percent) sites revealed *B. gingivalis* only. In contrast, the MPI ≥ 1 group had greater proportions of sites revealing each bacterium: forty-two sites (29.8 percent) revealed *A. actinomycetecomitans* only, eighty-seven sites (61.7 percent) revealed *B. intermedius* only and fifty-nine sites only (41.8 percent) *B. gingivalis*.

Discussion

This study supports the literature (Page *et al* 1983; Genco *et al* 1986; Slots *et al* 1986; Celenligil *et al* 1989) reporting the presence of *A. actinomycetecomitans, B.*

intermedius, and *B. gingivalis* in adults and children who have been diagnosed as having a form of periodontal disease, and also suggests that these organisms are detected in numbers of 10^3 or greater in healthy children between the ages of six to fourteen years who have not been previously diagnosed as having periodontal involvement.[1,12,15,16]

When comparing the number of sites revealing *A. actinomycetecomitans, B. intermedius, B. gingivalis* alone or in combination, *B. gingivalis* was present only with *B. intermedius* or in combination with both other organisms (Table 1). A synergistic relationship may be occurring between *B. intermedius and B. gingivalis*, with *B. gingivalis* establishing an environment conducive to *B. intermedius*. It is probable, too, that *B. gingivalis* was present in the flora but remained undetectable because of its low numbers. *B. intermedius* appeared to be the predominant organism in both the MPI = 0 and MPI ≥ 1 groups.

A. actinomycetecomitans was present in twenty-four of forty-six total sites. These findings may be due to several factors. *A. actinomycetecomitans* may have been in the flora of patients in this study, but in numbers too low to DNA probe detection. Subjects in Genco's study, in which *A. actinomycetecomitans* is the predominant bacterial organism, were clinically diagnosed as having Juvenile periodontitis, whereas none of the subjects in our study was so diagnosed.[12] Periodontally healthy individuals harbor *A. actinomycetecomitans* at a much lower prevalence (less than 20.0 percent), and in much lower numbers and in fewer subgingival sites than those with periodontitis.[12] Although the MPI ≥ 1 group evidenced supragingival plaque, and gingival inflammation in various amounts, participants in both the MPI = 0 and MPI ≥ 1 groups were generally considered to be healthy. This leads to the consideration that *A. actinomycetecomitans* is an exogenous infective organism largely associated with the disease process.

Several factors may have affected the study. The sample size may have been too small, only four sites sampled for detection of the presence of the organism. A problem with specific site testing is that some subjects may have normal gingival tissue and no supragingival plaque on the anterior teeth. If this is the case, then a higher percentage of organisms would have gone undetected, leading to an inappropriate assessment of the disease process.

A. actinomycetecomitans is an exogenous infective organism associated with the disease process.

Identification of the pathogenic organisms with the aid of the DNA probe can serve as a basis for future periodontal research. Future studies might examine racial, sex or age differences in the onset and development of periodontal disease. Longitudinal studies might assess the importance of various microorganisms in the initiation and progression of periodontal disease in children. Data might be collected from single or multiple sites or from plaque samples.

Conclusion

Results presented indicate that a significant number of children aged six to fourteen years had, as determined by DNA probe technology, a strong association between the presence of *A. actinomycetecomitans, B. intermedius*, and *B. gingivalis* and the disease process in children. This study also demonstrates the potential of the DNA probe in identifying these organisms. Early detection and monitoring of these bacteria with the use of DNA probe technology offers the potential for providing the dentist with valuable information to aid in selection of appropriate methods of treatment.

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EFFECT OF SORBITOL, XYLITOL, AND XYLITOL/SORBITOL CHEWING GUMS ON DENTAL PLAQUE

The effect of sorbitol (SOR) xylitol (XYL), and the mixture XYL/SOR in chewing gums on dental plaque was studied in three groups of 7 adults (mean age 22.5 years). A fourth group of habitual users of sucrose-containing gums was used as a control. The study involved a 2-week, no-gum period followed by the use of the polyol gums for 2 weeks (10 gums/day in 5 2-gum doses). The daily consumption of XYL and SOR in the XYL and SOR groups was 10.9 g; whereas in the XYL/SOR group, 8.5 and 2.4 g of these polyols were used per day. At the end of the gum period the acidogenic response of the 48-hour plaque was tested using a 10-ml mouthrinse containing the polyols (10% w/v) present in the experimental gums, followed by a 10-ml rinse of 10% (w/v) sucrose solution. The plaque of the subjects who used XYL and XYL/SOR gums showed a significantly better ability to resist pH drops induced by the sucrose rinse than the plaque in the SOR gum group. No changes in resting pH values were observed in the XYL and XYL/SOR groups; whereas the use of SOR gum was associated with significantly lower pH values. The amount of plaque decreased in the XYL/SOR (24.3%) and the XYL (29.4%) groups, but increased in the SOR (48.3%) group, the changes in the SOR group differing significantly from those found in the other groups. The plaque and saliva levels of *Streptococcus mutans* generally increased in the SOR group, but decreased in groups which used XYL.

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Demography

A litany for change

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

"One of the most unhappy results of our ongoing budget gridlock has been an uneven contest between the very young and the very old... That's because the old, however frail they may be, are sophisticated enough to use the political process to press their demands... The sad story of the 1980's was that the old have gotten more while the young have gotten less."[1]

—Representative Dan Rostenkowski (D.—Ill.)
Chairman, House Ways and Means Committee

"We've been successful with the elderly, and that's not something to be embarrassed about... But when it comes to allocating resources, we've been parsimonious with our children."[2]

—Senator Christopher Dodd (D.—Conn.)

CONSIDER

☐ The repeal of the catastrophic insurance component of Medicare in the waning days of the 1980s (in response to the vocal demands of the population over age 65) marks the first major "about-face" by the Congress in its continuing historic march to provide seemingly unlimited health and social services for the older segments of our country. Only time and politics will determine whether the Congress will consider again alternative approaches to the funding of a catastrophic program for the elderly.

Dr. Waldman is Professor and Chairman, Department of Dental Health, School of Dental Medicine, State University of New York at Stony Brook, Stony Brook, NY 11794-8715.

Among low-income families with children, income decreased 14 percent between 1979 and 1987, compared with a 19 percent increase for highest income families.

- ☐ The mind boggling developments in the East-West political arena, with the accompanying potential for reductions and redistributions of the defense budgets, could provide an opportunity for renewed emphasis for health and social welfare programs for our children.

Question

Are we in pediatric dentistry prepared to make the necessary case to ensure that the youth of our country will receive "their rightful share;" or are the needs of our children once again to be overshadowed by the demands of the aged?

If we are to make the case, each of us must have some specific information that could be used to provide the necessary data to those who can make the difference: the press, the politicians, and the general public. The following is but a beginning listing of this information. Each of us can add many items to help bring about a continued awareness of the needs of the children in our communities.

NUMBER OF CHILDREN

- ☐ By July 1990, there will be approximately 64.3 million persons under the age of 18 living in the United States.[3]
- ☐ Children continue to decrease as a share of the entire population. Between 1980 and 1986, however, the number of preschool children increased by almost 11 percent and will continue to increase through 1990. Minority children will be an increasing proportion of all children, comprising nearly one in four children by the year 2010.[3]

POVERTY

- ☐ More than half of the nation's poor were either children under 18 (39.5 percent) or people over 65 (10.3 percent).[4] Children are more likely than any other age-group to be living in poverty. In 1987, nearly 21 percent of all children and more than 22 percent of preschool children were living below the poverty line. By contrast, 12 percent of the elderly and 14 percent of all persons of all ages lived in poverty. Black and Hispanic children are two to three times more likely to be living in poverty than are white children.[3]
- ☐ More children than ever are living in the streets or in families shattered by divorce, drugs, or poverty.[5] Estimates of the number of children in the United States who are homeless on any given night range from less than 50,000 to 500,000.[3]
- ☐ Median family income has increased slightly since 1985, but it is still below the 1970 level (in terms of constant dollars). Family incomes of black and Hispanic children have continued to decline. Among low-income families with children, average family income declined 14 percent between 1979 and 1987, compared with a 19 percent increase for the highest income families. Households with children under 18 years of ages and headed by Black or Hispanic women are one and a half times as likely to be in poverty as those headed by white women. Black married-couple families with children have double the poverty rates of white married-couple families.[3]
- ☐ Over a half (56 percent) of children in poverty remain poor, despite receipt of aid from a variety of public assistance programs. An additional 23 percent of poor children do not receive aid.[3]
- ☐ In 1988, the United States spent nearly $20 billion in welfare payments and other benefits on families begun by teenage mothers. The 364,587 such families begun in 1988 will cost $6 billion over 20 years. If those births had been delayed by only a few years, the savings would have been about $2 billion.[6]

LIVING ARRANGEMENTS

- ☐ In 1950, 4 percent of all births were to unmarried mothers. In 1986, births to unmarried mothers accounted for 23 percent of all births. The number of births to unmarried mothers increased from

142,000 in 1950 to 878,000 in 1986. Among Blacks, more than three out of five births now occur "outside of marriage."[3]

- ☐ Between 1980 and 1988, the number of children living only with their mothers increased by 21 percent, from 11.4 million to 13.5 million. The proportion of children living with two parents declined from 88 percent in 1960 to 73 percent in 1988. The proportion living in single parent families increased to almost one-quarter. In 1988, 16 percent of white children, 27 percent of Hispanic children and 51 percent of Black children were living only with mothers.[3]
- ☐ Only 37 percent of women with children whose husbands are absent receive child support payments from the absent fathers. In 1985, child support payments accounted for 15 percent (down from 20 percent in 1978) of the income of women who received support payments. Child support amounts are lowest for less educated, never married and minority women. More than a million children per year (nearly two percent of all children) see their parents get divorced. In 1988, over two million children under eighteen years of age (or 3.2 percent) lived away from their parents. Black children are much more likely than white or Hispanics to be living away from their parents. Nearly one black child in thirteen lived with neither mother nor father in 1988. Over a quarter of a million children were in foster/substitute care during 1986.[3]
- ☐ In 1980, over 167,000 children were living in institutions (including mental institutions, detention centers, diagnostic and reception centers, training schools and homes for unmarried mothers). In 1987, more than fifty-three thousand juveniles were in public correctional facilities.[3]

WORKING PARENTS

- ☐ During the 1980s, the proportion of children under eighteen years of age with working mothers increased from 53 percent in 1980 to 60 percent in 1988. Women with infants make up the fastest growing group in the labor force. The proportion of women with children under six years of age increased from 29 percent in 1970 to 51 percent in 1988. The most common family arrangement for children today is to be living with two parents, both of whom are in the labor force. In 1988, 79 percent of Black women with children under six years of age (and with husbands present) were in the labor force.[3]
- ☐ The overall proportion of mothers working full-time grew by more than half between 1975 and 1988, rising from 29 to 44 percent. The greatest growth in the percent employed full-time has been among women whose youngest child is under three years of age.[3]

SCHOOL

- ☐ High school drop-out rates are relatively high among minority students (other than Asian) (e.g. Hispanic, 17 percent; American Indian, 25 percent).[3]
- ☐ Almost 2.1 million children five through thirteen years of age have no adult supervision after school.[3]

HEALTH CARE

- ☐ In 1988, 20 percent of all children had no form of public or private health insurance coverage, compared with 17 percent in 1982. "Near-poor" children had less insurance coverage than poor children, due to the difference in Medicaid eligibility.[3]
- ☐ The National Association of Children's Hospitals and Related Institutions has charged that the health and well-being of millions of American children are endangered because they are excluded from Medicaid coverage. Between 1978 and 1984, Medicaid spending per child decreased by 14.4 percent. Between 1980 and 1985, the number of poor children increased by 13.1 percent, while those covered by Medicaid increased by 2.5 percent.
- ☐ The incidence of low birthweight increased in 1987, the highest level since 1979. The racial disparity in the timely receipt of prenatal care increased slightly in 1987 as a result of a decline to 61 percent of black mothers receiving timely prenatal care. Delayed or not prenatal care was reported for 5 percent of white mothers and 22 percent of Black mothers.[8]
- ☐ Between 1984 and 1985 neonatal mortality increased nationwide by 3 percent among Black infants and by 1 percent among all nonwhite children (the first time there has been an increase since 1964). The rate of infant mortality remains nearly twice as high among Black infants as among white infants. The overall U.S. infant mortality rate placed it nineteenth in the world behind such countries as Spain and Singapore. A white infant born in the United States was two-thirds more likely to die in the first year of life than a baby

born in Japan. The U.S. Black low-birthweight rate ranks it 25th internationally behind such countries as Korea, Colombia, Costa Rica and Chile.[3,9]

- ☐ Except for mumps, the proportion of children, one to four years of age, who have been immunized against each of the major childhood diseases declined between 1980 and 1985.[3]
- ☐ As of early 1989, pediatric AIDS cases accounted for 1.6 percent of all reported AIDS cases.[3]
- ☐ The Centers for Disease Control estimate that 2.5 million teens are infected by sexually transmitted diseases each year.[3]
- ☐ Hay fever, chronic bronchitis, chronic sinusitis, and asthma are the most prevalent persistent respiratory conditions in childhood. Three to four million children have each of these conditions.[3]
- ☐ Approximately 3.2 million children (5 percent of the child population) are reported by their parents to have some form of activity limitation caused by a chronic health condition. About 2.2 million children are reported to have a limitation in a major activity; that is, a condition that limits school attendance (for school-aged children) or ordinary play (for preschool children).
- ☐ In 1987, one child in twelve had not seen a doctor in two or more years. Children from low-income families are less likely to receive medical care than children from more affluent families.[3]
- ☐ As of 1985, almost one third (31 percent) of males and females between twelve and seventeen years of age and 35 percent of youths between fourteen and fifteen years of age reported having consumed alcohol during the past month. By the time they are sixteen to seventeen years of age, one quarter of teenagers are smokers, one-fifth are marijuana users and one in thirty uses cocaine.[3]

CHILD ABUSE

Deaths among infants and young children due to homicide and undetermined injuries are representative of the more extreme forms of child abuse.

- ☐ In 1986, there were approximately nine deaths per 100,000 infants and three deaths per 100,000 children between one and four years of age, due to undetermined injury or homicide.[3]
- ☐ In 1985, there were almost two million (almost 2.2 million in 1987) reported cases of child maltreatment, including deprivation of necessities, minor and major physical injuries, sexual maltreatment and other cases of related emotional maltreatment.[3,10]

VIOLENT CAUSES OF DEATH

- ☐ In 1986, over 7,900 teenagers died in motor vehicle accidents. In 1987, almost a half of all teenage motor vehicle fatalities involved alcohol.[3]
- ☐ After declining through the early 1980s, homicide rates among children and youths increased between 1985 and 1986. In 1986, the rate for homicides involving infants was at its highest point in over twenty years. In 1986, homicide rates for Black youths were four to six times higher than those for white youths.[3]
- ☐ In 1986, more than 2,100 teenagers committed suicide.[3]

BUT WHAT DOES THIS HAVE TO DO WITH PEDIATRIC DENTISTRY?

The primary need is not to develop a national awareness for the dental needs of children. The need is to draw the attention of the press, community groups and legislators to the imbalance that exists in the priorities of the health and social programs for the youth of our nation (who can't vote). An awakening to the dental needs of our children and a need for financial support for these services will come as a natural extension of an appreciation of the historic imbalance in our priorities.

Well, now that you have some of the facts, let's get them to those individuals and groups where it will do the most good!

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Is there a future for pediatric dentistry? Reviewing the other side of the story

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

Continuing declines in dental caries in U.S. school children; an increase in the percent of children who are caries free; a decreasing percent of the population that is less than eighteen years of age; increasing numbers of pediatric dentists; increased third-party oversight; and .... Surely, pediatric dentists are in trouble?

There is no question, that the environment for pediatric dentistry is changing, but it is far from moribund. Chronicling the improving oral and general health status and changing delivery patterns of health services provides a general overview of the "favorable" developments affecting the health of children. But lost in the presentations of these developments is the proverbial "other side of the story": the general environment within which many children exist, the health services that are needed, the care that is not provided and the impact on the well-being of children, including:

- ☐ A one-third increase in child poverty in the last ten years.
- ☐ One child in four is classified as poor.
- ☐ Medicaid covers only a half of poor children.
- ☐ Seven million children do not receive routine medical care.
- ☐ Poor and minority children receive less dental care.
- ☐ Number of children without health insurance increased 13 percent in last five years.
- ☐ 10,000-20,000 pediatric cases of AIDS or AIDS-related-complex are expected in 1991.
- ☐ Child abuse and neglect increased by 23 percent between 1985 and 1986 (up to 5,000 deaths).[1,2]

Dr. Waldman is Professor and Chairman, Department of Dental Health, School of Dental Medicine, State University of New York at Stony Brook, Stony Brook, NY 11794-8715.

NUMBERS

The Bureau of the Census estimated that in 1986 there were 63.3 million residents under eighteen years of age in the United States. During the following twenty-five years, the proportion of the total population under eighteen years of age will decrease from 26 percent to 22 percent.[3]

The other side

The actual number of children will increase to 65.7 million in the year 2000 and then decrease to approximately the 1986 level in 2010 (62.6 million children). In the second half of the 1980s, despite continuing emphasis by the media on the economic status of the elderly, 13.2 million children (compared to 3.5 million elderly) were poor (Table 1).

DENTAL DISEASE

There has been a continuing decrease in rate of dental caries and a general improvement in oral status of children.

The other side

In 1986-87, half (50.2 percent) of the children in the nation were not caries-free. The average decayed-filled-surface rate in primary teeth was 3.91. The average

decayed-missing-filled-surface (DMFS) rate in permanent teeth was 3.07.[5] In the early 1980s, minority children required more services than nonminority children. Ninety-two percent of all school children had mild or moderate gingival inflammation. Children in nonurban areas had greater treatment needs than their counterparts in urban areas. Five million children were receiving or completed orthodontic treatment.[6] Children between eleven and twenty years accounted for 20 percent of all facial trauma.[7]

In 1987, children under five years had almost 650,000 acute dental conditions. Children under eighteen years had 3.6 million restricted activity-days, 1.1 million bed-days, and 470,000 lost school-days associated with dental conditions.[8]

PREVENTIVE SERVICES

Children who were exposed to water fluoridation had an 18 percent lower DMFS rate than children with no exposure to fluoridated water.[9]

The other side

In the mid-1980s, 40 percent of the population did not receive an optimally fluoridated domestic water supply.[9] In most age-categories, as much as 80-95 percent of children under seventeen years of age did not use fluoride supplements, fluoride mouth rinses, participate in fluoride rinse programs in school, or receive sealants in a dental office (Table 2). Poor and minority children, as compared to their nonpoor and nonminority counterparts, were less likely to use fluoride in tablets, drops and vitamins (Table 3).

The use of fluoridated water accounted for an 18 percent lower DMFS rate.

USE OF DENTAL SERVICES

Visits

In 1986, 53.8 percent of children under fifteen years of age visited a dentist.[12]

The other side

Two-thirds of children between two and four years of age and more than a quarter between five and seventeen years had no dental visits in the past year; 7.7 percent of older children never had a dental visit (Table 4). A greater percent of poor children and minority children, than nonpoor and nonminority children had

Table 1 ☐ The number and percent of poor by age: 1987.[4]

Age	Number (In millions)	Percent
< 6 yrs.	4.9	22.8
6–17 yrs.	8.3	19.4
65+ yrs.	3.5	12.2

Table 2 ☐ Children who do not use selected preventive dental practices: 1986.[10]

Age	Fluoride supplements	Fluoride mouth rinse at home	Fluoride rinse program at school	Dental sealants
2–4 yrs.	85.6%	93.2%	98.5%	99.1%
5–8 yrs.	87.2	85.6	84.5	93.6
9–11 yrs.	92.8	85.1	80.2	88.5
12–14 yrs.	97.3	84.6	90.6	91.2
15–16 yrs.	98.8	88.2	96.1	93.6

Table 3 ☐ Dentate children who do not use fluoride in tablets, drops and vitamins: 1983.[11]

Age	Poverty status		Race	
	Below	Above	White	Other
<2 yrs.	95.0%	83.2%	83.9%	94.9%
2–3 yrs.	94.4	85.2	85.4	95.2
4–11 yrs.	94.9	88.5	88.7	95.3
12–13 yrs.	97.8	95.8	95.9	98.2
14 + years	99.5	99.3	99.3	99.5

Table 4 ☐ Children with no dental visits by age: 1986.[10]

	Age	
	2–4 years	5–17 years
No visit in last year	66.5%	28.5%
Never had a visit	62.9	7.7

no dental visits in the previous year (Table 5). A half (49.4 percent) of Mexican American children ages five to eleven did not visit a dentist in the previous year; 24.3 percent never visited a dentist.[14] In 1986, as compared to children from noncentral areas of cities, a great percent of inner city children and children from nonmetropolitan areas had no dental visits in the previous year (Table 6).

The very young

The American Academy of Pediatric Dentistry "...urg(es) early parent counseling and dental/oral examination for all infants, prior to 12 months of age."[15]

The other side

In the early 1980s, half the children (five to eight years of age) did not visit a dentist before five years of age. A greater percent of minority children (in particular Hispanic children) and children from low-income families, as compared to their respective counterparts, did not visit a dentist before age five. In addition, more than two-thirds of children, from families where the head of household had less than twelve years of education, did not visit before the age of five (Table 7).

DENTAL INSURANCE

In the mid-1980s, almost one hundred million people in the United States had some form of dental insurance.[17]

The other side

Almost 60 percent of children have no dental health insurance (Table 8). Smaller percents of minority group children (particularly black children), children from lower income families, children in inner city areas, and children from western areas of the United States, as compared to their respective counterparts, had dental insurance.[10] And in 1986, as compared to children with dental insurance, children with no insurance had fewer dental visits in the previous year and a smaller percent went for a dental checkup at the time of their last dental visit.[10]

SPECIAL PATIENTS

In 1987, more than a third of Medicaid expenditures were for the blind and disabled.[12]

Table 5 ☐ Children with no dental visit in the past year by family income and race: 1986.[13]

	Age		
Income	2–4 yrs	5–11 yrs	12–17 yrs
Less than $10,000	73.1%	43.9%	43.2%
$10,000–$19,999	74.3	38.2	42.4
$20,000–$34,999	68.7	26.3	28.9
$35,000 +	57.0	13.7	14.2
Race			
White	67.9	26.6	27.1
Black	74.0	42.8	45.4

Table 6 ☐ Children with no dental visit in the past year by residence: 1986.[10]

	Metropolitan area		
Age	Central	Noncentral	Nonmetro. area
2–4 yrs.	70.9%	66.2%	70.9%
5–11 yrs.	32.5	24.9	34.3
12–17 yrs.	34.9	25.4	33.9

Table 7 ☐ Children (5–8 years old) who did not visit a dentist before five years of age: 1982.[16]

Total	49.4%
Race:	
White	47.0
Black	61.0
Non-Hispanic	47.2
Hispanic	68.0
Family income:	
Less than $10,000	61.8
$10,000–$19,999	55.3
$20,000–$34,999	44.8
$35,000+	29.5
Education—less than 12 yrs. (head of household):	
White	68.4
Black	66.8

Table 8 ☐ Children with no dental insurance: 1986.[10]

Age (in years)	Percent
2–4	59.8%
5–11	57.2
12–17	56.9

Table 9 ☐ Physically handicapped children with no dental visit in past year: 1986.[10]

	Age		
	2–4 yrs.	5–11 yrs.	12–17 yrs.
No limitations	68.9%	29.3%	29.8%
Limited but not in major activity	52.0*	26.0	27.2
Limited in major activity	62.1*	31.5	26.7
Unable to carry out major activity	75.3*	27.9*	46.6*

*Relative standard error greater than 30%.

The other side

By the mid-1980s, more than three million children had a variety of physical limitations. More than a quarter of a million handicapped children were in preschool programs. And more than 4.3 million children were in special education programs.[18,19] In 1986, a quarter or more of children with physical limitations over four years of age did not visit a dentist in the previous year (Table 9). In general, the handicapped population has higher rates than the nonhandicapped population for poor oral hygiene, gingivitis and DMFT rates.[20-22]

During the 1980s, there was a 15 percent decrease in total constant dollar dental Medicaid expenditures, a 23 percent decrease in constant dollars per dental recipient and a 400,000 decrease in number of child recipients.[1,2,23,24]

IS THERE A FUTURE FOR PEDIATRIC DENTISTRY?

Whom have pediatric dentists been treating?

In the mid-1980s, parents and guardians reported almost 120 million dental visits for children between two and seventeen years of age. Pediatric dentists provided almost 19 percent of the visits for children between two and four years of age and approximately 9 percent for children between five and eleven years; 1.4 percent for children between twelve and seventeen years of age.[25]

In each age-cohort between two and seventeen years, more total visits and visits per child to pediatric dentists were reported for 1) female children, 2) nonminority children, and 3) children from higher income families, than their respective counterparts.[25]

Overall, 49 percent of general practitioners and 96 percent of pediatric dentists report treating handicapped children.[26]

Treating an expanded population

The dental profession has been most effective in meeting the needs of the "traditional child population": the child of the more affluent, more educated and urban residents. The other side of the story is that, while general statistics of oral health status, insurance coverage, utilization patterns and related factors do show improvement, there is a population of underserved children who continue to need services, including members of minority groups, children from less affluent families, children residing in nonurban regions and special population children.

It seems almost unnecessary to state the obvious: the future of pediatric dentistry (and dentistry in general) must include services to an expanded population of patients. The dental profession continues to emphasize the great strides that have been made (and rightfully so) and secondarily to present, "the other side of the story."

In a reversal of this standard approach (call it public relations or whatever), when seeking government and other third-party financial support, or establishing community and private practice based programs, pediatric dentists must emphasize first, the needs of the underserved populations and only then, indicate all that has been accomplished for "traditional population groups."

Is there a future for pediatric dentistry? Indeed there is. And this future can be realized more readily (for the profession and the community we serve), if we successfully present "the other side of the story."

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MINERAL LOSS DURING ETCHING OF ENAMEL LESIONS

This study was aimed at determining the amount of mineral removed from incipient enamel lesions during acid etching. The rationale being that fissures which are scheduled for sealing will often have undetected demineralized regions. Lesions were formed in bovine enamel specimens using either an acidified gelatine gel or a lactate buffer containing methane hydroxy diphosphonate. Different parts of each lesion were acid-etched either for a 1- or for a 2-min period in 36% H_3PO_4 or served as control. Mineral content profiles were recorded on thin sections using computerized microradiography to determine the mineral loss resulting from acid etching. The results show that during etching a layer at the outer surface is removed completely. The thickness of this layer was greater for lesions when compared with sound enamel and depended on the lesion characteristics (porosity and fluoride content). The amount of mineral removed from the deeper layers of the lesion was very small; and in the innermost part of the lesions the mineral profiles of the control and acid-etched areas coincide. These observations indicate that the effect of etching is essentially restricted to a thin outer layer, irrespective of the porosity of the underlying tissue. Although the thickness of the etched-off layer was different between the two types of lesions, these findings were made for both types studied. In practical terms this implies that etching of enamel lesions does not cause an excessive mineral loss throughout the lesion.

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Craniofacial and intraoral manifestations of congenital hemifacial hyperplasia: report of case

Case reports

Dennis N. Ranalli, DDS, MDS
Rolando Guzman, DDS, MDS
John A. Schmutz, DMD, PhD

Subtle asymmetric variations of the contralateral structures of the head and face occur commonly in the general population.[1] These slight variations usually are neither detrimental functionally nor esthetically, may remain unnoticed, or may be perceived as providing character or enhancing natural beauty.[2]

The perception of structural normality occurs along a gradient of values. At some point on that spectrum, the normal gradient overlaps the lower limits of the abnormal gradient, thus rendering definition less certain and diagnosis more judgmental. When the severity of the abnormality becomes more extreme, however, definition becomes more clearly discerned and diagnosis more precise.

The purpose of this report is to present a case history of a child with hemifacial hyperplasia to supplement existing clinical knowledge and further to suggest implications for the diagnosis and treatment planning of individuals affected by this congenital disorder.

REVIEW

Marked unilateral overdevelopment of the hard and soft tissues of the head and face is a rare congenital

Dr. Ranalli is Director, Advanced Pediatric Dentistry Program; coordinator of Dental Services, Cleft Palate-Craniofacial Center, and Associate Dean, University of Pittsburgh, School of Dental Medicine. Dr. Guzman is former Chief Resident, Pediatric Dentistry, and Resident in Orthodontics, University of Pittsburgh, School of Dental Medicine. Currently in private practice in Costa Rica. Dr. Schmutz is Associate Professor, Diagnostic Services, University of Pittsburgh, School of Dental Medicine.

malformation, variously described as hemihypertrophy, partial or unilateral gigantism, and hemifacial hyperplasia.[1,3-5]

Pollock and colleagues, in a histologic study of an individual affected by this malformation, determined an increase in the number of cells present (hyperplasia), rather than an increase in cell size (hypertrophy).[5]

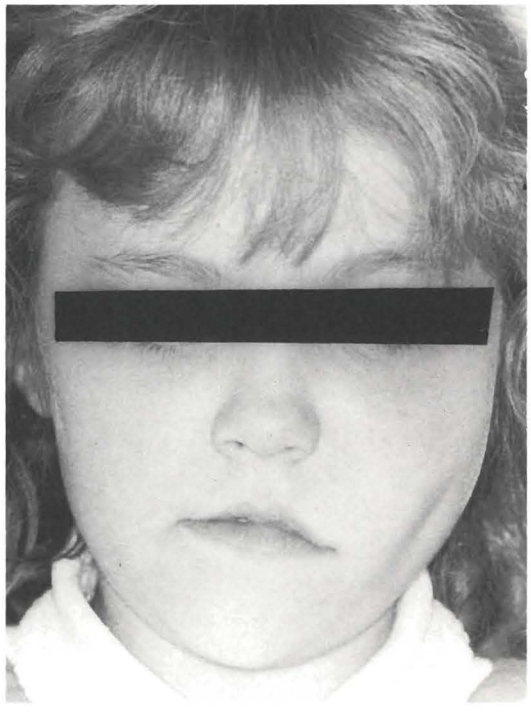

Figure 1. Left hemifacial hyperplasia with unilateral overdevelopment of the face including a cheek prominence with inferior indentation and lip asymmetry with inferiorly directed commissure.

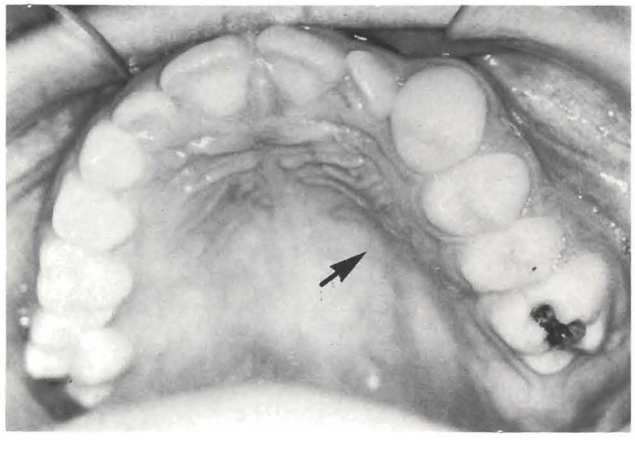

Figure 2. Intraoral view of the maxillary arch demonstrating advanced dental development and enlarged alveolar process on the affected left side.

Since the facial asymmetry is often noted at birth and increases progressively until skeletal maturation is complete, the term congenital hemifacial hyperplasia is thus more precise both histologically as well as developmentally.[6]

While the exact etiology of congenital hemifacial hyperplasia remains obscure, numerous factors such as biochemical, chromosomal, hereditary, embryonic, endocrine, vascular, lymphatic, and neurologic have been postulated.[5,7-13]

Craniofacial clinical manifestations of congenital hemifacial hyperplasia vary among cases reported, with the right side in males affected most frequently. Rowe suggested that enlargement of all tissues including teeth, bone and soft tissue, may occur on the affected side in an area bounded superiorly by the frontal bone, inferiorly by the lower border of the mandible, medially by the facial midline, and laterally by the ear.[6]

Intraorally on the affected side, the dentition matures earlier.[14] The primary teeth calcify, erupt and exfoliate sooner than the contralateral teeth. Similarly, the permanent teeth on the affected side calcify and erupt earlier and may be larger in all dimensions. The roots of the teeth may be abnormally short and the congenital absence of teeth has been reported also. Overdevelopment of the maxillary and mandibular bone shows as wide and thick alveolar ridges. The tongue is usually enlarged with exaggerated papillae. The tongue enlargement begins abruptly at the midline and results

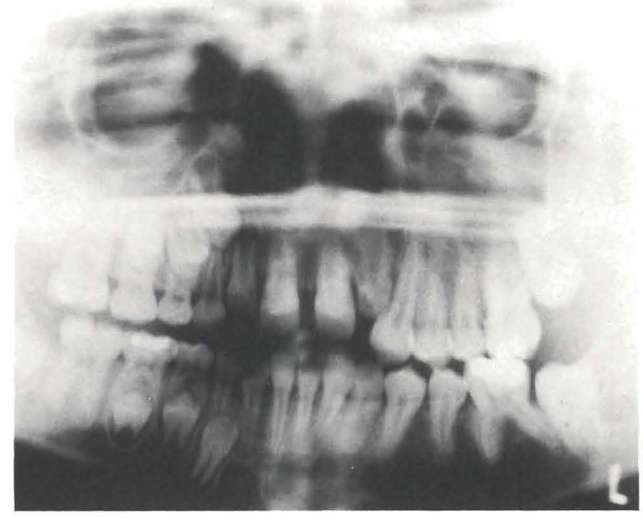

Figure 3. Panoramic radiograph at age 7.7 years, demonstrating age-consistent dental development and eruption pattern on the right side, compared to advanced development on the left side.

in a deviation toward the normal side on protrusion.[5,6,15]

Congenital hemifacial hyperplasia has been reported to occur in conjunction with conductive hearing loss, seizure disorders, and Wilm's tumor.[16-18] It is not limited to the structures of the craniofacial complex; but may involve the entire side of the body, including the hemiface, the trunk, and the extremities.[5] Additionally, segmental and crossed hyperplasia can occur. In crossed congenital hemifacial hyperplasia, overgrowth of the lower extremity occurs on the side opposite to the facial asymmetry.[19]

CASE REPORT

The patient, a 7.7-year-old white female, was first seen at the Graduate Pediatric Dentistry Clinic of the University of Pittsburgh School of Dental Medicine for an initial oral examination before routine dental treatment. Chief complaints were related to the overlapping of the anterior teeth, an occasional aching jaw and odontalgia.

The medical history revealed that at age 3.10 years, a tumor had been removed from the left cheek. Subsequent review of the hospital records indicated that, utilizing an intraoral approach, total surgical excision of the tumor with microscopic dissection and reimplantation of the parotid duct had been accomplished under general anesthesia.

The gross specimen was described as a 3 x 2 x 0.8 cm nodule of fibrofatty tissue, connected by a thin membranous isthmus to a nodule of yellow adipose tissue of similar dimensions. The weight of the total specimen was 10 gm. Microscopic examination demonstrated mature adipose tissue with no atypical cells. Peripheral nerve bundles, skeletal muscle fragments and fibrovascular tissues were embedded within the specimen. The postoperative diagnosis was that of an infiltrating lipoma.

Eight days postoperatively the patient presented with fever as well as swelling and erythema at the operative site. Aspiration revealed a localized suppurative exudate from which *Streptococcus viridans* was cultured. The patient was placed on ampicillin to reduce the abscess. Due to repeated accumulation of fluid, at ten days postoperatively, under general anesthesia, a drainage suction tube was placed surgically. The fluid was released and the subsequent course of healing was uneventful.

The remainder of the medical history was noncontributory with no evidence of hearing impairment, seizure disorder or renal impairment. On physical examination, the upper and lower extremities appeared symmetrical. The patient appeared to be well nourished and well developed, measuring within the 25th percentile on the Stuart and Meredith growth curve.[20]

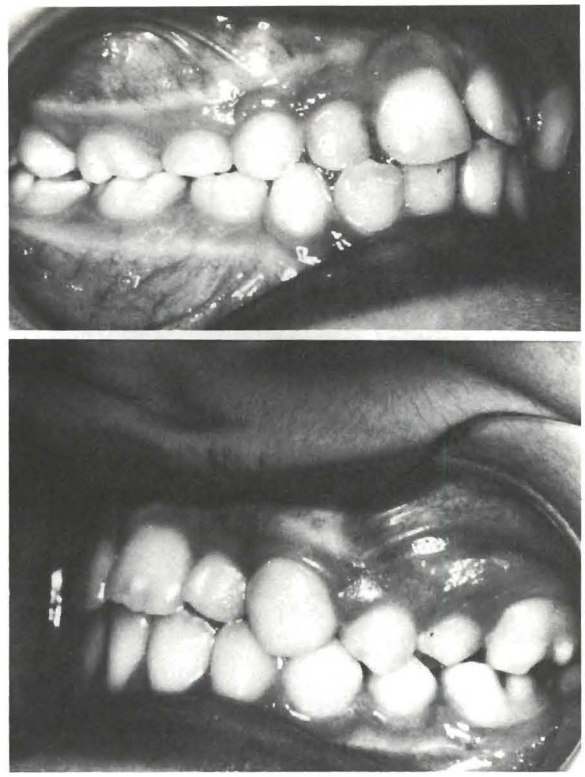

Figure 4. Intraoral views of the right mixed dentition and the left permanent dentition in Class I relationship.

A diagnosis of hemifacial hyperplasia of the left side was established following extraoral soft tissue examination, intraoral hard and soft tissue inspection, and radiographic interpretation of the teeth and craniofacial osseous structures.

Extraoral soft tissue examination revealed a distinct asymmetry of the face with overdevelopment of the left side, including a prominence of the left cheek with an indentation inferiorly (Figure 1). A deviation of the symphysis of the mandible to the unaffected right side was noted on opening. The lips were asymmetrical with the left commissure directed inferiorly. The left eye was in a position horizontally superior to the right eye.

Intraoral inspection disclosed good oral hygiene and normal periodontal soft tissues. Incipient carious lesions were noted on the buccal surfaces of the maxillary and mandibular right permanent first molars. Class I occlusal amalgam restorations were present in each of the permanent first molars as well as the mandibular right second primary molar. The eruption pattern of the teeth on the right side was consistent with the age of the patient. On the affected left side, the dentition in both the maxillary and mandibular arches consisted entirely of permanent teeth with the exception of an impacted maxillary left lateral incisor (Figure 2). The affected left permanent dentition appeared to be several years advanced in development compared to the unaffected right side mixed dentition (Figure 3).

The maxillary and mandibular alveolar processes were larger on the affected side than on the unaffected side.

Additionally, a tooth size discrepancy was determined. In the maxillary arch, the left permanent first molar measured 10.5 mm mesiodistally and 12.5 mm buccolingually, compared to the right permanent first molar, which measured 9.0 mm mesiodistally and 10.5 mm buccolingually. In the mandibular arch, the left permanent first molar measured 11.0 mm mesiodistally and 11.0 mm buccolingually, while the right permanent first molar measured 9.5 mm mesiodistally and 10.0 mm buccolingually. These molars as well as the canines were found to be in Class I occlusion (Figure 4).

The left maxillary and mandibular alveolar processes were larger in all dimensions than those processes on the right side (Figure 2). The tongue deviated to the right side on protrusion and demonstrated unilateral enlargement as well as prominent papillae on the affected left side (Figure 5).

The visual examination was confirmed by radiographic interpretation. The PA and panoramic radiographs revealed asymmetry of several osseous structures. The affected left side demonstrated enlargement of the body of the mandible, the gonial angle and the mandibular canal, when compared to those structures on the unaffected contralateral side. Additionally, the affected left side exhibited increased vertical dimension of the maxilla and mandible. The left zygomatic process was enlarged and asymmetrical sphenoid and mastoid planes were evident (Figure 6).

The authors wish to express their thanks to Ms. Kathleen Siroky for her assistance in the preparation of this paper.

While the primary dentition and the stage of development of the permanent dentition on the unaffected right side were consistent with the chronologic age of the patient, premature development of the permanent canines, first and second premolars, and the second molars was evident on the affected left side (Figure 3).

The initial treatment consisted of preventive procedures and the treatment of the carious lesions on the buccal surfaces of the maxillary and mandibular right first permanent molars. The patient has since been observed on a six-month schedule for routine pediatric dental recall services.

Following the completion of the initial treatment plan, the patient was referred for a multidisciplinary evaluation at the University Center for Dento-Facial Abnormalities in the Department of Orthodontics, where she was evaluated by a team of oral and maxillofacial surgeons, maxillofacial prosthodontists, orthodontists, a speech-language pathologist, and a clinical psychologist.

The patient was evaluated for extraoral soft tissue esthetics, skeletal pattern and development, and dental development and functional occlusion. Ideal treatment objectives were established as follows:

- ☐ Soft tissues: Achieve Class I profile and reduce protrusion of the chin.
- ☐ Skeletal: Achieve Class I skeletal relationship and decrease the lower anterior facial height.
- ☐ Dental: Maintain Class I molar and canine relationships, coordinate arches, and correct the midlines.

The patient, now ten years of age, demonstrates a functional occlusion, even though all of the primary

Figure 5. Tongue demonstrating deviation to the right side on protrusion and unilateral left side with pronounced papillae.

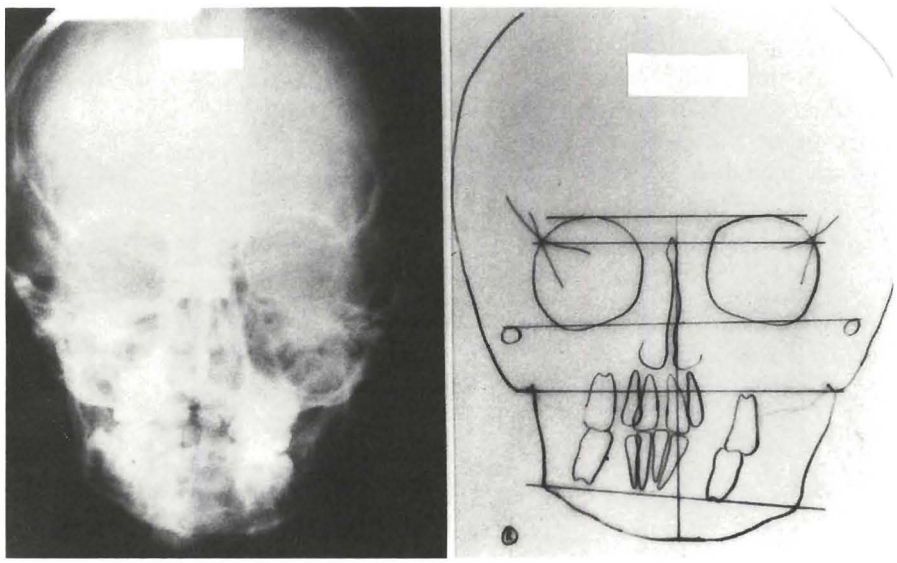

Figure 6. PA radiograph and tracing demonstrating overdevelopment of the left mandibular corpus and gonial angle, increased vertical dimensions, and asymmetrical sphenoid and mastoid planes.

teeth on the right side have yet to exfoliate. The impacted maxillary left permanent lateral incisor has erupted. Reevaluation for subsequent surgical/orthodontic management will commence, following the exfoliation of the existing primary teeth and the eruption of their permanent successors.

DISCUSSION

Subtle asymmetric variations of contralateral structures of the face and head are common occurrences, and indeed, can be esthetically enhancing.[2] Unless the asymmetry is pronounced, it is perceived as being within the range of normal variance. The point at which contralateral dissimilarity is perceived as abnormal is entirely subjective. This concept is clearly evident, when one considers the difficulties encountered in establishing an early diagnosis or perception of the occurrence of congenital hemifacial hyperplasia in a child.

The initial presenting sign in this case was a mass of the cheek. Hanley, *et al* related that, although enlargement of the ear, cheek, tongue, lip, jaws, zygoma, and cranium are common characteristics of this anomaly, augmented growth of the cheek is primarily responsible for the observed disfigurement.[17] It is imperative that the attending physician or dentist expeditiously evaluate such gross facial deformations to rule out neoplastic disease as well as fibrous dysplasia, the craniofacial dysostoses, and chronic inflammatory disease. In so doing, however, it is equally incumbent upon the diagnostician to follow a conservative approach and consider the histologic appearance of a hyperplastic buccal fat pad. Moreover, extensive surgery in this region may unduly compromise the integrity of branches of the facial and trigeminal nerves.

A retrospective review of family photographs of the patient presented suggests the possibility of asymmetric enlargement of the left side of the face as early as two months of age. The asymmetry had progressed sufficiently to the extent that surgical intervention was undertaken at age 3.10 years. Moreover, between 3.10 and 7.7 years of age, the patient had amalgam restorations placed in her permanent first molars.

Since in hemifacial hyperplasia, the facial asymmetry is often noted at birth and increases progressively, and furthermore, since enlargement of all tissues may occur on the affected side, it is disturbing to note that the congenital disorder in this patient was not diagnosed definitively until the age of 7.7 years.[6]

While it is imperative that masses of the neck and facial areas in children be explored, the first evidence of such masses as well as the growth pattern and possible differential diagnoses must be evaluated thoroughly before surgical intervention. Both the preoperative as well as the postoperative diagnoses were of an infiltrating lipoma, with no apparent further evaluation that this mass might have been related to the condition of hemifacial hyperplasia.

The microscopic examination that demonstrated welldifferentiated adipose tissue, peripheral nerve bundles, skeletal muscle fragments and fibrovascular tissue is consistent with a diagnosis of an enlarged buccal fat pad, a primary characteristic of hemifacial hyperplasia.

The importance, therefore, of a thorough diagnostic evaluation in the presence of characteristics such as

those observed in this child cannot be overstated. Additionally, the philosophy of multidisciplinary team evaluation and treatment planning is a decided asset in determining the nature of such disorders as well as the proper timing and sequence of treatment based upon the child's overall growth potential, dental development, speech, and psychological status.

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EFFECTS OF METHYLPHENIDATE IN HYPERACTIVE CHILDREN

In the present study, the effects of 0.3 mg/kg and 1.0 mg/kg of methylphenidate on the overt behavior and academic functioning of 12 children with an established diagnosis of attention deficit disorder with hyperactivity were evalauted. A double-blind, placebo-control, within-subject (crossover) design was used, in which each child was tested four times in each drug condition. Drug conditions were alternated on a bidaily basis and each child received two different drug conditions each day. The academic tasks were designed for evaluation of the relationship between task complexity and dose. Whereas overt behavior improved with increasing dose, academic functioning was improved with methylphenidate, but did not vary with either dose or task complexity. Also, investigated were potential carryover effects of a monitoring dose of methylphenidate on performance in the afternoon. Behavioral and academic improvements produced by a dose of 0.3 mg/kg in the morning were not longer evident in the afternoon, but a morning dose of 1.0 mg/kg produced behavioral improvements that were clinically and statistically discernible in the afternoon, although the academic improvements had dissipated. *Pediatrics*, 1989; 84:648–657.

Tannock, R. *et al*: Dose-response effects of methylphenidate on academic performance and overt behavior in hyperactive children. Pediatrics, 84:648–657, October 1989.

The complications of late diagnosis of anterior supernumerary teeth: case report

Roberto Solares, CD, MS

Supernumerary teeth are defined as teeth formed in excess of the normal dental formula.[1] The prevalence of supernumerary teeth in the general Caucasian population ranges between 1 to 3 percent.[2,3] The prevalence among Hispanics ranges between 2 to 2.65 percent.[4,5] Approximately 90 to 98 percent of all supernumerary teeth occur in the maxilla, with a strong predilection for the anterior region.[1,2,6,7] Multiple supernumerary teeth occur in approximately 14 percent of the subjects examined.[1,8,9] There is general agreement that males are affected twice as frequently as females.[13-7] A large percentage of anterior supernumerary teeth remain unerupted (approximately 75 percent), while 25 percent are partially or fully erupted.[4,5,9]

The etiology is unknown, but hyperactivity of the dental lamina is the most widely accepted theory.[1] The prevalence is also higher in patients with cleft palate, cleidocranial dysostosis and Gardner's syndrome.[1,3,6]

There are two morphologic types of supernumerary teeth: supplemental and rudimentary. Supplemental refers to supernumerary teeth of normal shape and size. Rudimentary forms include conical, tuberculate, and molariform types.[1] Conical shaped supernumerary teeth are the most common and occur in the midline area (mesiodens).[1,2,4-7]

The complications most often associated with unerupted supernumerary teeth are: enlarged follicular sacs, cystic degeneration and nasal eruption.[1,10,11] Supernumerary teeth in the maxillary anterior region can also cause a variety of pathological disturbances to the developing dentition such as: overretention of primary teeth, delayed eruption of permanent incisors, bodily displacement or rotation, impaction, diastema, root resorption and loss of vitality.[1,4,5,7,10-12]

When any of the above complications occurs or is anticipated, surgical removal of the supernumerary tooth is indicated. The optimal time for surgical intervention is controversial. There are two main schools of thought: immediate versus delayed. Immediate intervention calls for removal of the supernumerary teeth soon after diagnosis. On the other hand, delayed intervention indicates removal should not occur until adjacent root formation is complete, generally between eight and ten years of age.[1]

Early surgical intervention is preferred, to induce spontaneous eruption of the permanent incisors, prevent anterior space loss, midline shift, and extensive surgical/orthodontic treatment.[1,13]

The purpose of this paper is to report the complications resulting from the late diagnosis of anterior supernumerary teeth, in a fourteen-year-old male.

CASE REPORT

A fourteen-year-old Mexican male presented to the dental clinic for his first dental examination, with a chief complaint of "two funny looking upper front teeth". The medical history obtained from the parent indicated that the adolescent was in good health, with no previous systemic diseases. The patient appeared to be of

Dr. Solares is Associate Professor, Department of Pediatric Dentistry, School of Dentistry, Universidad Intercontinental, Ave. Insurgentes Sur #4135, Mexico, D.F. 14000, Mexico.

normal height, weight, and physical development for his age. The family history was unremarkable, but the dental history indicated that at age seven, the patient suffered an incident of orofacial trauma.

Clinical examination revealed two overretained primary central incisors in the maxillary arch. Both teeth presented a grayish discoloration, probably due to the previous traumatic injury. All permanent teeth were present, except for the maxillary permanent central incisors (Figure 1). The patient presented with poor oral hygiene, occlusal caries lesions on all first and second permanent molars, and mild gingivitis. The patient also presented a Class I molar relationship with normal overjet and overbite of the maxillary anterior permanent teeth.

Radiographic examination revealed two tuberculate type supernumerary teeth and two impacted maxillary permanent central incisors (Figure 2). The supernumerary teeth were the main cause of impaction of the maxillary permanent central incisors. The roots of the latter were developed completely, while the roots of the supernumerary teeth were not. Partial root resorption of the overretained maxillary primary central incisors was also evident.

The available space was insufficient to accommodate the impacted permanent central incisors in the maxillary arch, since there was an anterior space loss of approximately 8 mm. After consultation with the oral surgeon and orthodontist, the patient was referred for further treatment.

DISCUSSION

The presence of supernumerary teeth should be suspected, if there is a significant delay in the eruption of the maxillary permanent central incisors.[12] The frequency with which supernumerary teeth occur justifies a complete initial oral radiographic examination, because early detection is crucial, if esthetic and clinical complications are to be avoided or minimized.[14]

If the supernumerary teeth are removed early, the impacted teeth may erupt spontaneously without orthodontic treatment.[10] Reports say that the majority of unerupted teeth (approximately 75 percent) will erupt once the supernumerary tooth is removed.[15,16] If surgical exposure is necessary, the prognosis for spontaneous eruption is excellent (approximately 85 percent).[16] Surgical exposure of the unerupted incisor crown should be made only if there is lack of eruptive movement following a period of observation (six months), and enough arch-space exists for eruption. Orthodontic traction should be applied when spontaneous eruption does not occur after surgical exposure.[1]

The supernumerary teeth were the main cause of impaction.

Not all supernumerary teeth should necessarily be removed. Immediate removal is not necessary, if no orthodontic treatment involving the region of the supernumerary tooth is planned and if the child is seen regularly by a dentist.[17]

Tuberculate type supernumerary teeth have either incomplete or total absence of root formation. For this reason, they must be surgically removed, because they rarely erupt and frequently delay the eruption of the adjacent teeth. Immediate removal to induce spontaneous eruption is desirable, before eruption of the lateral incisors can cause space-loss.[1]

The complications associated with the presence of supernumerary teeth in this case were: overretained maxillary primary central incisors, loss of eruptive potential of the maxillary permanent central incisors (root formation completed), displacement, impaction, and loss of anterior arch-space.

The preceding case report is unusual for two reasons:

- ☐ Diagnosis of anterior supernumerary teeth was made in a fourteen-year-old, much later than usual.
- ☐ The extremely negligent attitude of both the parent and child toward seeking regular dental care.

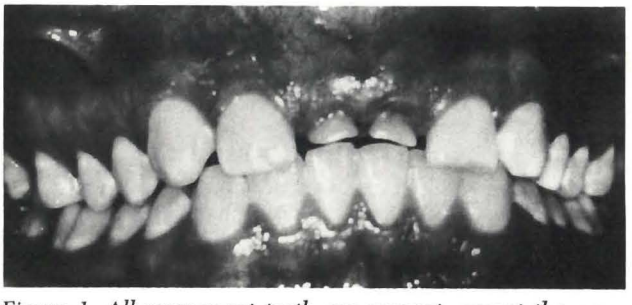

Figure 1. All permanent teeth are present, except the maxillary permanent central incisors. Note overretained maxillary primary central incisors and loss of anterior arch-space.

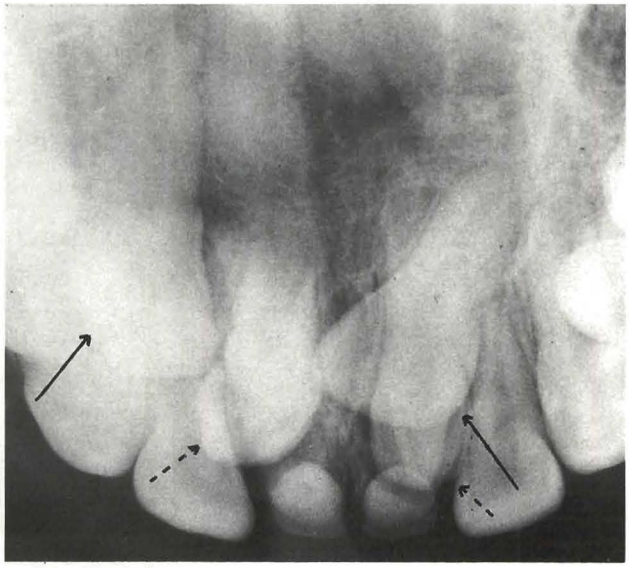

Figure 2. Radiograph showing two tuberculate type supernumerary teeth causing the impaction and displacement of the maxillary permanent central incisors. Dotted lines indicate supernumerary teeth; straight lines indicate impacted permanent teeth.

Surgical and extensive orthodontic treatment will be required to bring the unerupted, impacted maxillary central incisors into proper alignment. Due to the severe loss of anterior arch-length, adequate space for tooth eruption must be provided before surgery.

Finally, surgical removal of supernumerary teeth, especially tuberculated forms should occur immediately following diagnosis, in order to reduce the risk of complications.

Gratitude is extended to Dr. Jose A. Ramos Tercero for reviewing the manuscript.

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PENETRATION OF SELF-GELLING LIQUIDS IN OCCLUSAL FISSURES

In this *in vitro* study the ability and speed of self-gelling liquid compositions to penetrate into fissures were evaluated. Two formulations containing either tetraethylsilicate, ammonium fluoride, and sodium lauryl sulfate or tetraethylsilicate, sodium fluoride, and cetylpyridinium chloride at different concentrations were used. It is shown that fissure penetration occurs when a certain minimum content of surface-active agent is present. Fissure penetration is achieved within 3-4 s, according to the fissure morphology.

Bottenberg, P. *et al.*: Penetration of fluoride-containing self-gelling liquids into human molar occlusal fissures *in vitro*. Caries Res, 23:303–308, 1989.

Familial hypophosphatemic vitamin D-resistant rickets: review of the literature and report of case

Shahrbanoo Fadavi, DDS, MS
Elisabeth Rowold, DDS

Vitamin D-resistant rickets, which does not respond to therapeutic doses of vitamin D, was first described by Albright in 1937.[1] It is characterized by decreased renal tubular reabsorption of inorganic phosphate, normal serum calcium levels, increased alkaline phosphatase levels and no aminoaciduria.[2] It has been shown that vitamin D-resistant rickets is an inherited sex-linked dominant disease affecting males more often than females.[3] Affected females are heterozygous and affected males are mutant hemizygous. Generally, affected males tend to show more severe disease than females, as is expected of an x-linked trait. For unexplained reasons, there is no consistent correlation between the severity of hypophosphatemia and the severity of bone disease in females.[4]

In familial hypophosphatemia, the dental findings are often characteristic and are the first clinically noticeable signs of the disease. Hence it is very important for dentists to be aware of this condition, as early diagnosis can prevent the crippling deformities of rickets. Reports show that familial hypophosphatemia is the most common form of rickets in the United States today.[5]

REVIEW OF THE LITERATURE

Early clinical signs, usually detected at about two years of age, include lateral bowing of the lower extremities, scoliosis and frontal bossing. Other signs of rickets are short stature, enlargement of wrists and ankles, and pseudofractures. Bony protuberances of the sites of major muscle attachments are common findings in these patients. Rachitic deformities can result in dwarfism.[6]

The typical radiographic characteristics of vitamin D-resistant rickets include widening of the skull sutures, coarsened trabeculation, rarefied areas of bone, and widening at the epiphyseal area at the ends of the long bones.[7]

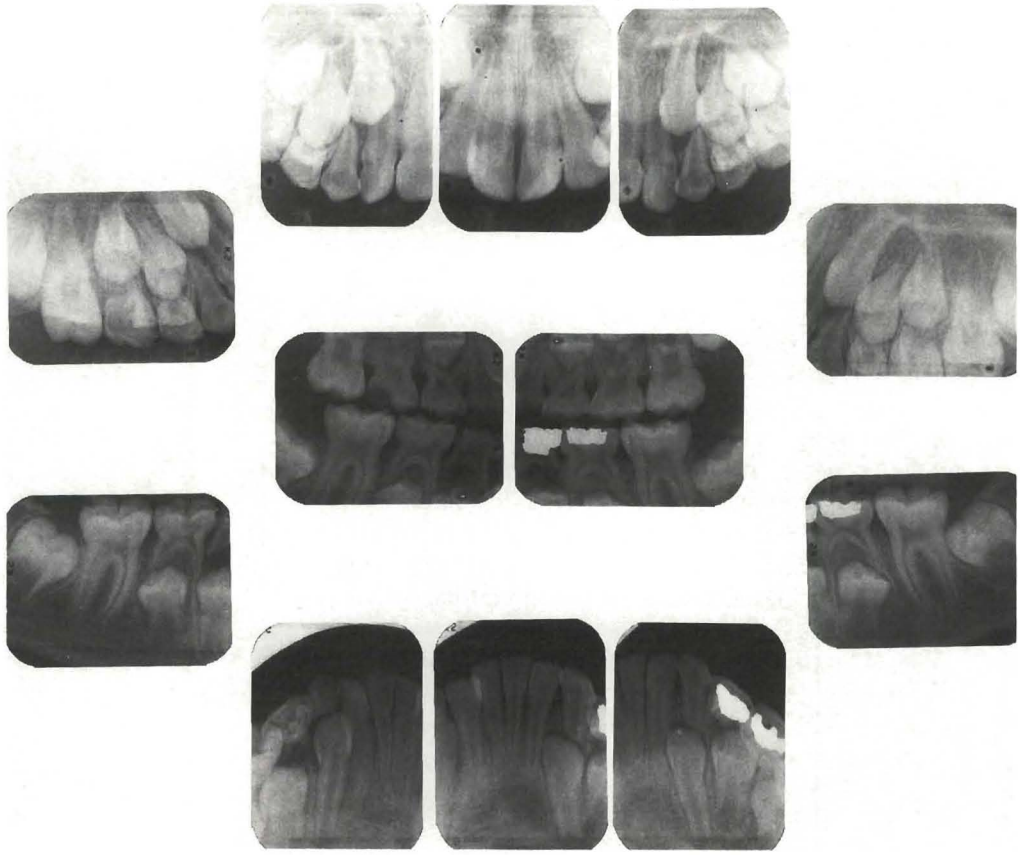
Although the general signs and symptoms of x-linked hypophosphatemia were recognized since the 1930s, it was not until 1960 that Harris and Sullivan for the first time reported the dental signs characteristic of this disease.[8] Typical clinical involvement may comprise multiple draining periapical abscesses, fistulae, and fractured teeth not associated with caries or trauma. Obscure or absent lamina dura, abnormal alveolar bone patterns, enlarged pulp chambers, and extension of the pulp horns into the cuspal tips also have been reported on radiographic examination.[7,9] Delayed eruption of teeth in children with vitamin D-resistant rickets was reported by several authors; but others did not find it as a consistent occurrence.[1,7] Histologically, evidence of abnormal dentin formation with large tubular clefts or voids extending to the dentinoenamel junction in the areas of pulpal horns is noticed.[10]

Many investigators reported the histological characteristics of dentinal abnormalities of rickets. In a study by Abe *et al*, numerous microscopic abnormalities, such as interglobular dentin, wide predentin zones, and tu-

Dr. Fadavi is Assistant Professor and Dr. Rowold is Clinical Instructor, Department of Pediatric Dentistry, University of Illinois at Chicago.

Figure 1. Physical appearance of patient.

Figure 2. Full-mouth radiographs of patient.



bular defects were reported.[11] The concentration of phosphorus in the dentin of a patient with familiar VDRR was extremely low. Using a scanning electron microscope, Sauk and Witkop confirmed the basic dentin defect to be elongated pulpal horns extending into the incisal edge just below the enamel.[12] Typically, the dentin is thin and consists of large calcospherites or globules of abnormally calcified dentin.[13] These are separated by wide irregular zones of interglobular dentin. In addition, an absence of secondary dentin formation in teeth of patients with x-linked hypophosphatemia was reported.[14]

CASE REPORT

A ten-year-old Hispanic female, a known case of vitamin D-resistant rickets, was referred to the Pediatric Dentistry Clinic, University of Illinois at Chicago, by her physician in September, 1986. The chief complaint was the presence of multiple carious teeth and dental abscesses. She was diagnosed as a vitamin D-resistant rickets case at eighteen months of age, following a six-month period of therapy with vitamin D injections. Physically she was of short stature for her chronological age, with moderately bowed legs (Figure 1). Her familial history showed the presence of vitamin D-resistant rickets on her mother's side of the family, with an aunt and a grandmother involved. Her recent blood analysis indicated her serum calcium value to be 11.0 mg/100 ml, serum phosphorus value to be 2.5 mg/100 ml, and serum alkaline phosphatase value to be 14.9 BU/100 ml. She was treated with oral rocatrol (activated form of Vitamin D) 0.5 mg daily and was under control.

Her dental history showed that the upper primary incisors were extracted at age three, because they were abscessed. Several dental workups at ages four, five, and eight resulted in numerous unsuccessful amalgam restorations. On examination, numerous carious primary and permanent teeth were observed. Two remaining fractured amalgam restorations were present in the mandibular left first and second primary molars, both with recurrent caries. Fistulous tracts were present on the buccal aspects of mandibular left and right first primary molars. The color of the primary teeth appeared to be grayish pink. This could be due either to thinness of the enamel or to enlarged pulp chambers.

Radiographical examination disclosed large radiolucencies in the furcation areas of mandibular first primary molars, and large stellate pulp chambers with multiple pulpal horns extending close to the enamel and to the cuspal tips in the molar teeth (Figures 2 and

3). Large caries lesions on maxillary right and mandibular left second primary molars with potential pulp exposures were also seen. The maxillary left first primary molar showed distal caries; the maxillary left second primary molar, mesial caries; and the mandibular right second primary molar showed mesial caries on the radiograph. All other clinical caries was confirmed radiographically, too. Some type of hypoplastic lesion was diagnosed on the distal surface of maxillary right permanent lateral incisor and on the mesial surface of the adjacent central incisor, on the radiograph. Hypoplastic enamel is not a consistent characteristic, however, of x-linked vitamin D-resistant rickets.

Following a consultation with the child's physician, the patient was scheduled for comprehensive dental care. The mandibular first primary molars were extracted. Pulpotomies were done in the maxillary right and mandibular left second primary molars, using formocresol. Both of these teeth were restored with stainless steel crowns. All other primary and permanent teeth with evidence of clinical and radiographical caries were covered with glass ionomer cements before restoration with composite resins or amalgam restorations. The rationale for this was to prevent penetration of the defective tooth structure by the acid in the cementing medium and subsequent pulpal damage. In general, the maxillary first permanent molars (occlusolingual caries), the mandibular first permanent molars (occlusobuccal caries), the maxillary right first primary molar (occlusal caries), the maxillary left first primary molar (distoclusal caries), the maxillary left second primary molar (mesioclusal caries) and the mandibular right second primary molar (mesioclusal caries) were restored in this manner. A lingual arch-space maintainer was inserted to prevent further loss of arch length after extraction of the lower first primary molars. This patient was observed on three recalls for a period of two years. No further dental caries or abscesses occurred during this period of two years (Figure 4). The patient then moved from the area and was not seen again by the authors.

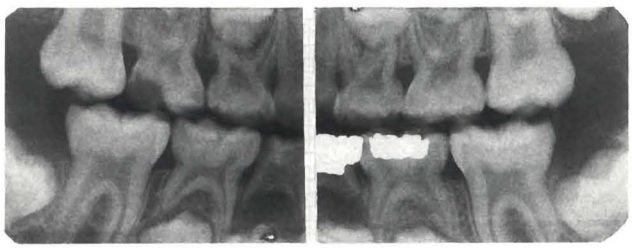


Figure 3. Magnified view of bite-wing radiographs.

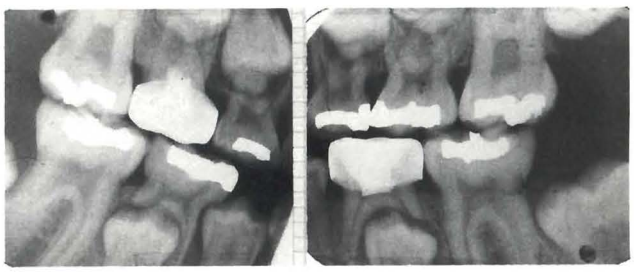


Figure 4. Twenty-four-month follow-up bite-wings. Note the amalgam restorations, pulpotomies, and crown restorations; all appear to be in good condition.

DISCUSSION

Although x-linked hypophosphatemia VDRR is a rare genetic disease, it was reported as the most common form of rickets in the United States today. It is very important for dentists to be aware of this condition and the dental manifestations of this disease, because in

Familial hypophosphatemic vitamin D-resistant rickets is the most common form of rickets in the United States today.

some cases, the skeletal signs and symptoms may be mild and easily missed. The confirmation of hypophosphatemia with dental findings will permit early diagnosis and prevent crippling rachitic deformities.

Dental management in patients with x-linked hypophosphatemia VDRR should aim at controlling existing infection and the prevention of pulp exposures. Formocresol pulpotomy in VDRR patients is considered controversial, because a pulp altered morphologically and histologically (increased collagenous and decreased cellular components) inhibits formation of secondary dentin in VDRR patients. Some investigators reported unsuccessful pulp therapy in VDRR patients and others recommended complete avoidance of pulp therapy in these patients.[10,15] In this case report we treated two teeth (maxillary second primary molars) with formocresol pulpotomy with a successful result, for a period of two years. In addition, the primary and permanent molars, which were restored with amalgam restorations, showed no sign of recurrent caries. This success could be attributed to early diagnosis and beginning treatment at eighteen months of age, because the calcification of second primary molars and permanent molars occurs after that age. Prophylactic full coverage restorations are recommended, however, by other investigators.[4] Previous reports debate whether enamel hypoplasia and delayed eruption patterns are consistent findings in VDRR patients. In this case, however, both findings occurred to a minor degree.[4]

The prevention of dental caries cannot be overemphasized in patients with x-linked hypophosphatemia, because even minimal caries lesions can lead to pulp exposures. Thin enamel and abnormal dentin in these patients lead to occlusal wear and enamel attrition, which is the classical etiology contributing to the formation of spontaneous abscesses. This is another reason for prophylactic full coverage restoration in these patients. Although there does not appear to be a correlation between the severity of VDRR and the frequency or severity of dental and oral morbidity, in this case enamel attrition was not observed. Diet counselling, oral hygiene instruction, and systemic and topical fluorides must be given, however, to these patients regularly.

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A dental and facial anomaly not previously reported with VACTERL association: report of case

Daniel C. Topper, DDS
Richard D. Zallen, DDS, MD
Randy L. Kluender, DDS, MS

In 1968 Say and Gerald first reported a syndrome of polydactyly, imperforate anus, and vertebral anomalies.[1] Tunte in 1968 confirmed the presence of this syndrome after reviewing a series of 103 patients with anal atresia and suggested that ectrodactyly and polydactyly be included as interchangeable limb deformities.[2] Millard in 1969 also reported such a case with the addition of congenital heart disease.[3] Kaufman reported a case of a patient with imperforate anus and vertebral and renal abnormalities who had a hypoplastic thumb on the left hand and preaxial polydactyly of the right foot.[4] Blood lymphocyte karyotype revealed a normal 46 XY male chromosome pattern; family studies failed to support a genetic etiology.[5] The syndrome was expanded in 1973 by Quan and Smith, who noted a broader association of five defects and formally labeled the associated defects the **VATER** association, designating ***V**ertebral defects, **A**nal atresia, **T**racheo-**E**sophageal fistula with esophageal atresia, **R**enal defects,* and ***R**adial limb dysplasia*.[6] The hypothesis was advanced that simultaneous occurrence of any of these defects in the same individual, based on their individual incidences, is so unlikely that it suggests a nonrandom association; such a nonrandom association could occur, however, from a common type of defect in the mesoderm that became involved in the early development of these tissues.[6] Any or all of the anomalies could be accounted for by a defect in disorganization of the mesoderm that occurred before the thirty-fifth day of conception.[6] The **VATER** association was confirmed by Temtamy and Miller in 1974, when they presented ten new cases and included two other anomalies: namely, ventricular septal defect (VSD) and single umbilical artery (SUA).[7] Because of these findings the suggestion was made that the ***V*** in **VATER** stand not only for vertebral defects, but also for vascular anomalies including VSD and SUA. Other malformations were noted in cases of **VATER** association, including duodenal atresia, auricular defects, cleft-lip/palate, absence of spleen, unilateral aplasia of lung or testes, female pseudo-hermaphroditism, hypospadias, persistent urachus, and unilateral hypoplasia of hip bone and a common iliac artery.[7] Chromosome studies did not reveal any chromosome abnormalities.[7] Nora and Nora, in 1973, described a syndrome known as **VACTEL** (*Vertebral, Anal, Cardiac, Tracheal, Esophageal, and Limb*); their study revealed exposure, at a vulnerable period in embryogenesis, to progesterone-estrogen compound or a single progesterone. These hormones were taken either as a pregnancy test or mistakenly without realizing that pregnancy existed. The multiple anomalies of the **VACTEL** association recapitulated the systems involved in the thalidomide syndrome but presented a different pattern. In 1974 the **VACTEL** ac-

Dr. Zallen is Director of Dentistry and Oral maxillofacial Surgery, Denver General Hospital, 777 Bannock Street, Denver, Colorado 80204. Dr. Topper, formerly chief resident in Oral Maxillofacial Surgery, Denver General Hospital, is now in private practice in Encinitas, CA. Dr. Kluender is Pedodontic Consultant at Denver General Hospital, and in private practice in Longmont, Colorado.

ronym was changed to **VACTERL** for *Vertebral, Anal, Cardiac, TracheoEsophageal, Renal, and Limb.*[9] A study by Khoury *et al* confirmed the clinically recognized nonrandom occurrence of the **VACTERL** association.[10]

Other than cleft/lip/palate reported by Say and Temtamy no report of any dental or oral anomalies associated with **VACTERL** have been reported in the literature.[7] The purpose of this article is to document the presence of another dentofacial anomaly in a case of **VACTERL** association which perhaps should expand the acronym to **VACTERL-DF** (*Vertebral, Anal, Cardiac, Tracheo-Esophageal, Renal, Limb, and Dento-Facial).*

REPORT OF CASE

A three-year-old Hispanic male presented to the Denver General Hospital Dental Clinic in November 1987, where his mother voiced the chief complaint that he had "a lot of cavities". The mother also gave the history of failure to thrive and as a result he had been permitted to drink a "lot of Kool-Aid".

The patient's medical history was significant for **VACTERL** association, which was diagnosed shortly after birth. At birth the patient was noted to have a small underdeveloped right pinna, right radial claw hand with an anomalous thumb without bony structure, severe hypoplasia of the radius, and shortening and thickening of the right radius and ulna. Radiographs revealed agenesis of the right lung, dextrocardia, severe thoracic vertebral anomalies from T1 to T9 and only eleven ribs. The right kidney appeared to lie transversely in the posterior abdomen instead of in the renal fossa. A chromosome study done soon after birth revealed a normal 46 XY karyotype.

The surgical history was significant for an episode of increasing shortness of breath beginning at age six months, and diagnosed as tracheal stenosis. Surgery was performed and rib cartilage was placed as a stent into the trachea and left mainstem bronchus. After a prolonged hospital course of six months, the patient was discharged in stable condition.

Due to the amount of restorative dentistry required, it was decided that this patient would best be treated under general anesthesia. Because of family and scheduling problems he was not admitted to Denver General Hospital until November, 1988.

Physical examination in November 1988 revealed a small but well-nourished four-year-old Hispanic male (Figure 1) with a small underdeveloped right pinna, right radial claw hand with an anomalous thumb, and severe hypoplasia of the right radius and ulna. In addition, a large open posterior fontanelle was noted. Our dental examination revealed a grossly carious dentition and the need for multiple extractions, pulpotomies, stainless steel crowns, amalgam and composite restorations (Figure 2). The mandibular left primary canine and lateral incisor were fused at both the crown and root surfaces, but radiographically had separate root canals and pulp chambers. A panographic radiograph (Figure 3) showed an atypical hypoplastic right condylar head, as well as some atypia of the left condylar head. The chin was deviated 5 mm to the right with

Figure 1. Full-face view showing deformed right ear, facial asymmetry, and anterior maxillary dental decay.

Figure 2. Oral view showing extensive decay and fusion of the left mandibular primary central and lateral incisors.

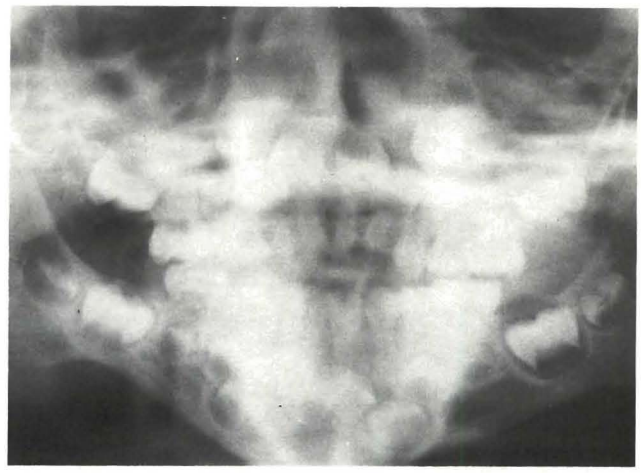

Figure 3. Panographic radiograph showing condylar hypoplasia on the right with mandibular asymmetry and fusion of the left mandibular central and lateral incisors.

apparent decreased development of the right mandibular ramus. This mandibular development is highly suggestive of hemifacial microsomia.

Laboratory studies obtained at the time of admission showed a normal CBC with differential, SMA 6, and urinalysis. The chest x-ray (Figure 4) revealed agenesis of the right lung, dextrocardia, thoracic vertebral anomalies, a bifid left sixth rib and kyphoscoliosis.

The following morning the patient was taken to the operating room, where, after ketamine induction, he was successfully intubated nasally. A throat screen was placed and the mouth was prepped with a 50:50 hexachlorophene 3 percent saline solution. After being prepped and draped in the usual fashion, the throat was packed with a vaginal pack to secure the oropharynx. All restorative procedures were performed with rubber dam isolation. Due to deep caries, the maxillary central incisors, right lateral incisor, the mandibular right canine and the fused teeth previously referred to were extracted (Figure 5). Pulpotomies were done on the right maxillary primary molars and the mandibular primary canines and left first molar and restored with stainless steel crowns. The maxillary left primary canines and second molar, and the mandibular primary second molars and right central and lateral incisors were restored in amalgam and composite as appropriate. The patient tolerated the procedure well and was extubated in the operating room, and discharged the following day without complications.

Figure 4. Chest x-ray showing kyphoscoliosis, dextrocardia, anomalies of thoracic vertebrae, and bifid left sixth rib.

Physical force or pressure may cause two developing teeth to fuse.

DISCUSSION

VACTERL association is a nonrandom association of vertebral defects, imperforate anus, tracheo-esophageal fistual, radial and renal dysplasia, and a single umbilical artery. Other less frequent defects include prenatal growth deficiency, postnatal growth deficiency, ear anomalies, large fontanelles, defects of the lower limbs, rib anomalies, and defects of the external genitalia.[11] Deformities of mandibular development and teeth have never previously been documented in **VACTERTL** association.

Hemifacial microsomia was first described by Gorlin and associates who described patients with unilateral microtia, macrostomia, and failure to fully form the mandibular ramus and condyle.[12] Autosomal dominant, autosomal recessive, and multifactorial modes of inheritance are all possible causes of hemifacial microsomia. Poswillo was able to show a possible etiology of hemifacial microsomia, when he demonstrated that destruction of differentiating tissues in the region of the ear and jaw by an expanding hematoma produced a branchial arch abnormality, the severity of which was related to the degree of local destruction.[12,13]

Patients with hemifacial microsomia may have minimal underdevelopment of the condyle or unilateral aplasia of the mandibular ramus and/or condyle with absence of the glenoid fossa. Microtia, a small malformed ear, occurs in over 70 percent of patients with

The authors wish to express their sincere thanks to Drs. L.K. Munk, L. Kutina and S. Leva for their help in treating this patient.

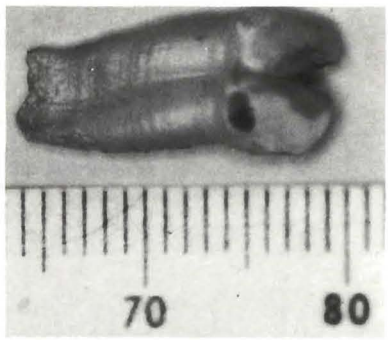

Figure 5. Gross specimen of extracted left mandibular central and lateral incisors showing fusion.

agenesis of the ramus and conversely about 50 percent of patients have ramus agenesis. The gonial angle is commonly flattened and the maxilla is narrowed on the involved side. Intraorally, decreased palatal width is noted from the midline palatal raphe to the lingual surface of the teeth on the affected side.[12]

Also seen in hemifacial microsomia are bony abnormalities, especially of the vertebral column, which are seen in 40 percent to 60 percent of patients. The most common findings include occipitalization of the atlas, cuneiform vertebrae, complete or partial cervical synostosis of two or more vertebrae, supernumerary vertebrae, hemivertebrae, spina bifida, and anomalous ribs. Other abnormalities include various forms of heart defects, pulmonary agenesis with the missing lung occurring on the ipsilateral side, and various renal-genitourinary defects.[12]

There is to date, no published studies linking hemifacial microsomia as a component of **VACTERL** association; many of the signs and symptoms are identical, however, and would suggest a common etiology.

Fused teeth arise from the union of two normally separated tooth germs. It is thought that physical force or pressure produces contact of the developing teeth and then subsequent fusion. If the contact of the developing teeth occurs before calcification, they may be completely united to form a single large tooth. If the contact occurs later, when a portion of the crown has completed its formation, there may be union of the roots only. It has been reported that fusion of teeth is more common in the primary than the permanent dentition.[14]

SUMMARY

A case of **VACTERL** association has been presented in conjunction with possible hemifacial microsomia and fused teeth. Although the etiology of **VACTERL** association and hemifacial microsomia is unclear, the similarity of symptoms would suggest a common cause. A retrospective study of patients previously diagnosed with **VACTERL** association might reveal additional symptoms of dental and/or facial anomalies and warrant changing the acronym to **VACTERL-DF** in recognition of these dentofacial findings.

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Epidemiology

Dental findings of children with biliary atresia: report of seven cases

Ichijiro Morisaki, DDS, PhD
Keiko Abe, DDS, PhD
Lily S. M. Tong, BDS
Kazuo Kato, DDS
Shizuo Sobue, DDS, PhD

Congenital biliary atresia (CBA) is a rare disease of unknown etiology, occurring in approximately one in every 25,000 live births.[1,2] It is characterized by obliteration or hypoplasia of one or more components of bile ducts. CBA as well as neonatal hepatitis are representative causes of severe infantile jaundice accompanied by hyperbilirubinemia (serum direct bilirubin: more than 5 mg/dl). The affected children are often plagued by long-standing cholestasis and life-long jaundice with signs of steatorrhea, dark yellow urine, hepatosplenomegaly, hemorrhagic diathesis, and pruritus. Furthermore, it is also not uncommon to have complications such as growth retardation, nutritional failure, cardiovascular and respiratory disorders from this disease. The prognosis of children with CBA is extremely poor, due to the complications of portal hypertension, cirrhosis, hepatic coma or respiratory tract infection. Early diagnosis and operative measures (portoenterostomy) introduced by Kasai *et al* have been shown, however, to be an effective initial step to improve the condition.[3,4] It also led to the increased demand for dental care for afflicted children.

These children are subject to various degrees of de-

Drs. Morisaki, Abe, Tong, Kato and Sobue are in the Department of Pedodontics, Osaka University Faculty of Dentistry, 1-8 Yamadaoka, Suita, Osaka 565, Japan.

Figure 1. Intraoral photograph of a child with CBA (Case #4). Remarkable green staining of teeth is observed when compared to an artificial tooth shade guide that simulates an average normal primary tooth.

Figure 2. Panoramic radiograph of case 4. Multiple caries lesions and periapical radiolucent lesions were seen in the mandibular second primary molars.

layed skeletal and dental development and intrinsic staining of the teeth and soft tissues with biliverdin, a bile pigment. Although CBA is one of the predisposing conditions to infantile jaundice, only a few papers have been reported describing the oral and dental manifestations and management of this disease.[5-8]

CASE REPORT

Seven patients, five females and two males, with surgically corrected biliary atresia, ranging in age from two years, five months to six years, six months (Table 1), were referred to our pedodontic clinic for dental examination and treatment from the pediatricians at Osaka University Medical Hospital (six cases) or Ikeda City Hospital, Osaka (case #5). These patients still showed apparent signs of cholestasia such as skin, nail and scleral staining with bile pigments, hepatosplenomegaly, pruritus and steatorrhea. Two male patients were also small in stature when compared to the average Japanese children of the same age. Several complications or accompanying diseases in the present cases are listed in Table 1.

Patients were examined clinically and radiologically and were provided routine oral prophylaxis and caries treatment, which included insertion of stainless steel crowns, amalgam, or composite resin restorations. When patients had cardiovascular disorders, treatments were performed under electrocardiogram monitoring and oxygen inhalation with the help of an anesthetist.

ORAL FINDINGS

The patients had dental caries of varying severity, and in some cases, periapical and periodontal lesions were also observed radiologically. Grayish-green staining of the primary teeth was noted in all subjects (Figure 1). Tooth staining was more intense in the cervical than in the incisal or occlusal regions. Erupted permanent teeth were also stained in five cases and the first permanent molars were hypoplastic. Oral panoramic radiographs of two male patients showed enlarged pulp chambers and root canals of their primary teeth (Figure 2).

Table 1 □ Oral and systemic findings in seven children with biliary atresia.

Case	Age[a]	Gender	Bilirubin staining			Dental age	Osseous abnormality	Complications
			Primary tooth	Permanent tooth	Gingiva			
1	6Y 6M	F	+	+	−	normal	−	−
2	6Y 1M	F	+	+	+	normal	−	pulmonary arteriovenous fistula
3[b]	4Y 4M	F	+	+	+	normal	−	−
4[b]*	3Y 11M	M	+	+	+	delayed	+[c]	heterotaxia, VSD, ASD
5[b]	3Y 8M	M	+	+	+	delayed	+[c]	short bowel, renal acidosis
6	3Y 4M	F	+	N.D.	−	normal	−	−
7[b]	2Y 5M	F	+	N.D.	+	delayed	−	−

a: Age at the first examination
b: The patient who had external biliary drainage at the first visit.
c: Hepatic rickets
N.D.: Not determined
VSD: Ventral septal defect
ASD: Atrial septal defect
*: died of hepatic coma

The development of the permanent teeth was either normal or slightly delayed, when compared to Japanese children at corresponding ages. The most striking sign in the oral soft tissues was the biliary staining of gingivae, tongue, buccal mucosa, and floor of the mouth. In general, their oral hygiene was poor and marginal gingivitis was a common finding at the first visit.

LABORATORY FINDINGS

Laboratory findings, including serum calcium, phosphate and total bilirubin levels, are listed in Table 2. Levels of calcium and phosphate were maintained within the normal range. Elevated serum bilirubin levels were noted, however, in five patients, even after the surgical correction of the disease. Patients were given Vitamins A, D, E, K and phosphate for the control of hypocalcemia, hypophosphatemia, bleeding diathesis and nutritional failure. Other laboratory data showed that alkaline phosphatase and transaminases (GOT and GPT) were also elevated in these children (data not shown).

Table 2 □ Laboratory findings in seven children with surgically corrected biliary atresia.

Case	Serum calcium[a] (meq/L)	Serum phosphate[b] (mg/dL)	Serum total bilirubin[c] (mg/dL)
1	4.7	4.8	0.6
2	4.6	5.6	1.4
3	4.7	4.3	17.6
4	4.3	5.0	9.5
5	4.7	4.5	25.1
6	4.8	5.2	0.7
7	4.4	4.6	15.8

Data obtained at the first visits of dental examination.
a: Normal range considered 4.4 – 5.3 meq/L.
b: Normal range considered 3.6 – 5.6 mg/dL.
c: Normal range considered 0.2 – 1.0 mg/dL.

HISTOLOGIC FINDINGS

The mandibular second primary molars with extensive caries and periapical granulomas of patient 4 (Figure 2), who had an anamnesis of hepatic rickets, were extracted (Figure 3). A contact microradiograph of the ground section of the tooth, 50 μm in thickness, failed to exhibit a specific pathologic dentinal change, such as prominent interglobular dentin, which is frequently seen in the tooth sections from rickets patients.[9,10] Decalcified sections stained with hematoxylin and eosin, however, showed wider predentin layers than normal tooth sections, and unhomogeneous staining of dentin, as shown in Figure 4. These findings suggest that the calcifications of dentin have been affected in patients with CBA. From the grayish-green coloration of teeth, it was assumed that there was an accumulation of bile pigments in the dental hard tissues. Attempts to detect the pigments in the decalcified sections stained with either hematoxylin and eosin or specific bile stain, however, failed.

DISCUSSION

Patients with CBA showed green staining of the teeth and soft tissues. The green staining of teeth seen in biliary atresia appears to be associated with fetal or neonatal hemolytic hyperbilirubinemia and kernicterus, caused by incompatibility within the fetal-maternal blood group.[11-14] This type of hyperbilirubinemia is characterized by a high concentration of bilirubin reacting indirectly in the serum. Because early diagnosis and exchange blood transfusions resulted in successful control of fetal or neonatal jaundice, hemolytic hyperbilirubinemia has markedly diminished in neonates. In the case of CBA, however, direct bilirubin

Adequate oral hygiene should be depended upon to compensate for serious nutritional problems, in the control of dental caries.

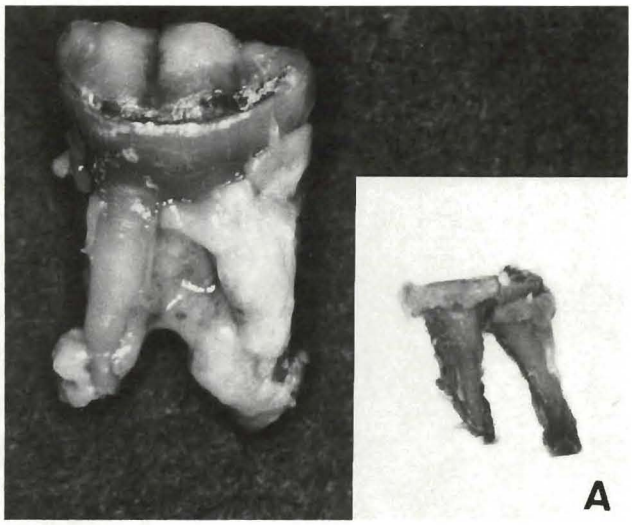

Figure 3. An extracted mandibular second primary molar of case 4. Enhanced green staining is seen (Figure 3A) when extracted tooth was fixed with formalin followed by decalcification in Morse's solution.

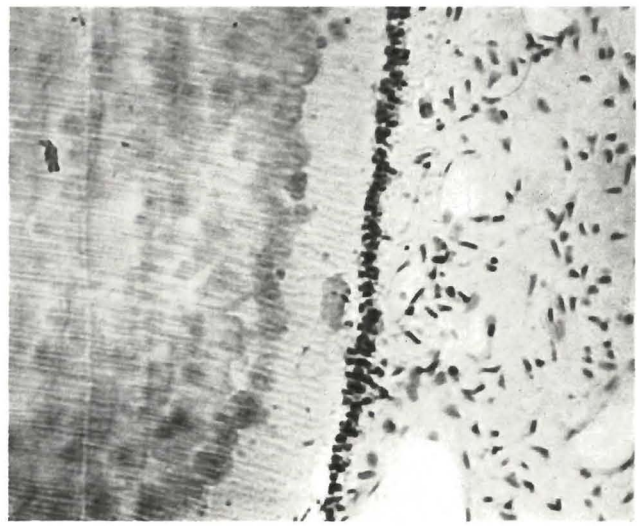

Figure 4. Decalcified and hematoxylin-eosin stained section of the extracted mandibular second primary molar, the same tooth as in Figure 3. Wide predentin layer and nonuniform staining of dentin are observed.

comprises a high serum concentration, probably contributing to the occurrence of green teeth in the affected patients.[6,14]

Current cases of biliary atresia show various degrees of green staining in the primary and/or permanent dentitions, suggesting a correlation between the degree of tooth staining and the severity of the disease. Bile pigments were not apparent in either ground or decalcified sections, in the present study. Attempts to demonstrate the presence of bile pigments histologically, are controversial.[5,15,16] Interglobular dentin found in some hyperbilirubinemia patients and in experimental animals is not detected in our cases.[13,15]

Rampant caries was found in five out of seven patients.[5-7] Enamel hypoplasia may occur in the children with CBA who have a history of unfavorable general health or nutritional problems in early infancy. Because CBA is frequently accompanied by a deficiency of fat-soluble vitamins, essential for the development and mineralization of bone and teeth, the dental hard tissues of the affected children may be more vulnerable to caries.[2,17] The dental caries occurring in the patients reported on in this paper seemed to be caused primarily by poor oral hygiene or prolonged bottle-feeding. Although more susceptible to dental caries, appropriate care could prevent its occurrence in these patients. As previous reports showed that the host defence mechanism might be altered in CBA, the importance of meticulous oral hygiene should be emphasized.

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A clinical evaluation of high- and low-fear children in Singapore

Hema Vignehsa, BDS, DPH Dent
Narendra Kumar Chellappah, BDS, LDSRCS, MSc, DDPHRCS
Peter Milgrom, DDS
Robert Going, DDS, MS
Choo Soo Teo, BDS, MSc, DDPHRCS

Relatively little is known about the prevalence or natural history of dental fear in children, anywhere in the world. Most work has been confined to clinical populations.[1-4] Nevertheless, the prevalence of high dental fear in Singaporeans, ages ten to fourteen years, was determined to be 177 fearful children per 1000 population (Chellappah *et al*, submitted for publication, 1989). Females report more fear than males. Children with direct access to an on-site dental clinic were twice as likely to report being fearful as those who had to seek care from public hospitals and clinics. On the other hand, Brown and colleagues reported that children with high levels of general anxiety were at greater risk for dental fear than those with lower levels of anxiety.[5]

As pointed out by Berggren, few studies addressed the effects of fear and the consequent avoidance of dental care on oral health.[6,7] Milgrom and colleagues reported fearful adults have longer intervals between dental visits and poorer self-reported oral health.[8] Cohen studied high- and low-fear military recruits and reported the high-fear group to have a greater number of decayed, unfilled tooth surfaces. Teo and colleagues (International Dent J, 40:37–42, February 1990) found a relationship between delay in dental visits and level of fear for university students, but not for military recruits, in Singapore.

The authors are unaware of any evaluations of the effect of dental fear on the oral health behavior of schoolchildren. In Singapore, all primary schoolchildren are eligible for free dental care delivered primarily by paraprofessional dental nurses under the indirect supervision of government dental officers. All but a few schools have on-site dental clinics. Children at schools with no on-site clinic may seek free dental care, on their own, from any government clinic.

The purpose of this investigation, part of a larger study of dental fear in Singaporeans, was to compare the oral health of fearful and nonfearful primary schoolchildren. The rationale for the evaluation was the premise that significant levels of fear may increase avoidance and deny access to dental care. In addition we investigated the notion that fearful children are more difficult to treat; the quality of restorations delivered to them might be lower, therefore, than that delivered to less fearful children.

Drs. Chellappah and Vignehsa are lecturers, Dr. C.S. Teo is Associate Professor and Dr. Going was Senior Teaching Fellow, in the Department of Operative Dentistry, National University of Singapore. He is now Associate Dean, College of Dentistry, Medical University of South Carolina. Dr. Milgrom is Professor, Department of Dental Public Health Sciences and Director, Dental Fears Research Clinic, University of Washington, Seattle, WA, USA.

MATERIALS AND METHODS

In January and February 1989, all of the 505 children in grades four and five in two representative Singaporean primary schools were surveyed for prevalence of dental fear using the Childrens Fear Survey Schedule (CFSS).[10] (Chellappah *et al*). One school had an on-site dental clinic and the other did not. The children who had access to the on-site clinic were treated by dental nurses who had direct access to the children and provided preventive, diagnostic and restorative care. The children with no access to an on-site dental clinic, sought care from public hospitals or private clinics, where care was delivered by dentists.

Study sample

The sample for this particular study came from the above group of 505 children. Children with CFSS dental fear subscores greater than or equal to 42 (high fear) and children with scores less than 18 (low fear) were selected for examination and evaluation. Sixty-five of eighty-one (80.3 percent) high-fear children and forty-nine of fifty-five (89.1 percent) low-fear children were examined. The examinations on some children were not completed, because of time constraints imposed by the school. The children were not given previous notice that they were to be examined. To ensure nonbias, the dental fear subscores of children who were examined and of those who were not examined were evaluated statistically (t-test). Overall, there was not significant difference between the CFSS dental-fear-score means of the children who were examined and those who were not ($p > 0.05$). In the school without a clinic, however, the children who were not examined were less fearful than those who were examined ($p = 0.056$). The mean CFSS dental fear score for children examined was 36.9; the mean of those not examined was 22.0. The higher value of 36.9 indicates that the results were obtained from a predominantly high-fear group, thus eliminating a matter of bias that could result from avoiding fearful children.

The children also completed the Spielberger State Trait Anxiety Inventory for Children (STAI-C).[11] To characterize children, the measure was dichotomized at the median of the sample.

Evaluation instruments

Oral hygiene, periodontal status, dental caries, and the need for urgent treatment were assessed, using the criteria specified by the World Health Organization.[12] Debris and calculus were measured, using the Simplified Oral Hygiene Index (OHI-S) where teeth 16, 11, 26, 46, 31, 36 were examined and oral hygiene was scored with codes from 0 to 3, where three was the maximum score.[13] Where a designated tooth was absent, an alternative tooth in the same sextant was substituted. Scores were expressed as averages. Periodontal assessment used the same six sites. Sites were assessed for bleeding on probing (score 1), calculus and defective fillings (score 2), or pocketing (scores 3 and 4). The worst situation at each site was recorded. Scores were averaged over the six sites. Only permanent teeth were examined for caries. Teeth were noted as sound, carious, restored and caries-free, restored and carious, or missing. Scores were expressed as counts. Teeth which were likely to require urgent treatment were also recorded.

Teeth and periodontal tissues were examined by a dentist using a mirror, explorer and periodontal probe. Examinations were conducted with the children seated on a portable chair equipped with a fiber-optic light. A single examiner (HV), experienced in carrying out the examination, was utilized; she was assisted by a recorder.

The quality of amalgam and composite restorations in permanent teeth was assessed, using clinical criteria suggested by Ryge.[14] All restorations were examined for marginal adaptation; anatomic form; recurrent caries; and where appropriate, for possible color match and marginal discoloration. Scores of quality ranged from Alpha (A) to Delta (D) for marginal adaptation and Alpha to Charlie (C) for anatomic form. Alpha indicated a satisfactory restoration, while Charlie (for anatomic form) and Delta (for marginal adaptation) indicated loss of material or fracture, calling for replacement. A Bravo (B) rating was given, if the deficiency present did not result in the exposure of dentin. All restorations were assessed, after drying with cotton gauze, by a single examiner (RG) experienced in carrying out the protocol using a mirror and explorer; he was assisted by a recorder. No radiographs were utilized. Restorations were assessed after the examination for oral health was completed.

The examinations were conducted by examiners unaware of the fear status of the children; and the children were unaware that they were being evaluated for fear.

RESULTS

Oral Health

The OHI-S debris score mean was 1.5 (SD = 0.61) with an actual range from 0 to 3. The median OHI-S calculus score was 0.3. Forty-three of 114 children had no calculus. The average periodontal score for the six sites was 0.86 (SD = 0.17) where score 1 denotes gingivitis. The number of children with at least one site probing of 4-5 mm was three (2.6 percent). None of the children had sites which probed greater than 6 mm.

Sixteen of 114 (14 percent) children had no caries-experience in the permanent dentition. Forty-nine of 114 (43 percent) of children had at least one unrestored carious tooth in the permanent dentition. The median number of unrestored carious teeth per child with active caries was one, with a range from one to seven. Forty-six of 114 (40.4 percent) of children had at least one restoration and nineteen of 114 (16.7 percent) children had at least one restored tooth with new or recurrent caries. Of these nineteen children, the median number of teeth with new (lesions not on the same surfaces previously restored) or recurrent (lesions adjacent to the existing restoration) caries was one with a range from one to seven.

Thirteen of 114 (11.4 percent) children had permanent teeth missing because of caries or trauma. In three children, permanent first molars were missing. Four children required urgent treatment because of gross caries.

Oral-health-by-fear status

A t-test was used to evaluate differences in mean OHI-S debris score for the high-fear ($\bar{x}$ = 1.45) and low-fear ($\bar{x}$ = 1.53) students; but this difference in means was not significant (t = 0.72, p > 0.05). Calculus score of the OHI-S was dichotomized as presence or absence of calculus and a chi-square analysis was conducted. There was no significant difference in the proportion of high-fear or low-fear children with calculus. (x^2 = 0.34, p > 0.05). A t-test was used to evaluate differences in periodontal score for the high-fear ($\bar{x}$ = 0.87) and low-fear ($\bar{x}$ = 0.85) children. There was no difference in the periodontal status by fear (t = 0.59, p > 0.05).

The dental-caries measure was dichotomized where children either had or had not active caries regardless of type. There was no significant difference in active decay between the two groups (x^2 = 0.02, p = 0.89).

Table □ Trait anxiety and untreated caries in previously restored teeth in Singaporean schoolchildren, ages 10–14 years.
(x^2 = 5.91 P = 0.015 N = 114)

Measure		Untreated caries: Present	Untreated caries: Absent
Trait anxiety	High	41	14
	Low	54	5

There were also no differences when initial decay and recurrent disease were examined separately.

HIGH RISK CHILDREN

It was hypothesized that a subset of fearful children might be at greater risk of oral disease, because of other social or environment factors. In order to explore this possibility, the oral health of children with high or low scores on the Spielberger trait measure was evaluated by chi-square analysis. There was no difference in proportions for the overall caries-measure, but the trait-measure was related to recurrent disease (Table). There were no differences in the OHI-S or periodontal measures between the groups (P > 0.05).

Quality of restorative care

Sixty-eight of 114 (59.7 percent) children had no restorations in permanent teeth. One hundred and seventeen restorations were examined in forty-six children. The median number of restorations in permanent teeth per child was two. Ninety-one of 114 (79.8 percent) amalgam restorations were intact and met all criteria for an Alpha rating. Similarly, all of three composite restorations met the Alpha rating criteria. Twenty-three of 114 amalgam restorations in twelve individuals received a Bravo rating indicating inadequate margins or contour. The proportion of children with Bravo-rated restorations was significantly greater in the school with no dental clinic on-site. Here, 52.6 percent (ten of nineteen) of the children with restorations had at least one restoration rated Bravo as opposed to just 7.4 percent (two of twenty-seven) with Bravo ratings amongst the children with restorations in the school with an on-site clinic (x^2 = 11.8, p = 0.001). Because of this finding the quality data were examined separately, by school. There were, however, no differences in the proportion of Bravo-rated amalgam restorations between the high- and low-dental-fear children (x^2 = 0.51, p = 0.48), or between those with high or low trait anxiety scores (x^2 = 0.99, p = 0.32).

DISCUSSION

The hypothesis the authors hoped to test was that children who are fearful may avoid seeking dental care, and that this would result in lower levels of oral health and/or poorer quality of care.

Overall, there were no differences between the high- and low-fear children in levels of debris, calculus, or periodontal disease. The levels of debris and calculus were fairly high. Although the overall levels of calculus are comparable with findings for twelve-year-old Singaporean children assessed by the Ministry of Health in 1984, the debris scores in this study are a little higher.[15] Similarly, there was a low prevalence of periodontal disease and mild gingivitis was predominant.

Overall, there was no difference in caries-activity between high- and low-fear children. The prevalence of untreated caries was high in both groups. As an exploratory investigation, the children were categorized as high- or low-risk based upon their Spielberger trait anxiety score. Children in the higher trait anxiety group had more recurrent dental caries. This finding is similar to that reported by Brown and colleagues regarding health status and background anxiety.[5] This may reflect a different pattern of care and requires additional investigation. In his assessment of high- and low-fear adults, Cohen similarly noted a significant difference in the decayed surfaces, in the two groups, but not in the filled or missing surfaces.[9] No other differences emerged, but it was interesting to note, anecdotally, that all the children with missing first permanent molars and 75 percent of those requiring urgent treatment fell into this high-risk category. The number of restored teeth per child was less than found in the Singapore survey in 1984.[15] In that survey it was noted that the filled component was less than in a similar survey conducted in 1979.[16] In 1979 a tendency for overfilling was noted and attempts to stop the practice of restoring questionable teeth with deep fissures resulted in a reduction between 1979 and 1984. A similar pattern of recognition, modification, and a reduction of filled teeth has been reported in New Zealand.[17]

Overall, restorative care provided by both nurses and dentists was clinically satisfactory. Eighty percent of the restorations received a satisfactory Alpha rating. A review of studies of the quality of restorations in various population groups reported that 75 – 80 percent of restorations were found to be satisfactory.[18] Of those restorations rated less satisfactory in this study, none belonged to the worst category: a category that indicates need for replacement.

There was a significant difference in quality of restorations obtained in the different schools with the proportions of children with the poorer Bravo-rated restorations being more frequent in the school children with no access to an on-site clinic. There was no difference in the proportion of Bravo restorations by fear-level.

There was no difference in caries activity between high- and low-fear children.

The hypothesis that more-fearful children would be in poorer oral health or obtain poorer dental care was not supported. Nurses who treat children at the school clinics claimed in a recent questionnaire (Chellappah 1989, unpublished findings) to have a low rate of children who prove 'difficult' and reject treatment (about five to six per year on average), while earlier analysis suggested that fear was common and that children with access to an on-site dental clinic were more likely to be dentally fearful (Chellappah *et al*). In their review, Holst and Crossner noted the tendency for dentists to assess the extent of the problem of dental anxiety several times less than children and their parents.[4]

Recognition of patients who are apprehensive is essential, if fears are to be overcome and positive attitudes and dental habits are to be established. Because the nurses have direct access to the children, avoidance because of fear may not be possible. Nonetheless, as the individual gets older and the need for self-decision on seeking dental care takes over, fear may cause health detriments not seen in this child population. Such findings have been suggested in adults.[8] In New Zealand, which has a similarly extensive school-based program, a drop-off of dental attendance of around 30 percent has been noted following independence of the public health system.[19] Kleiman has also pointed out that, although there is evidence suggesting fear is more common in young children, there is a greater likelihood of

avoidance by apprehensive parents and other adults.[20]

The study surprisingly showed that the oral health did not vary by school, since access is more difficult for the children without direct access. The answer may lie in the relatively high disease rate in both groups, thus masking any differences.

The quality of restorations was high, particularly those provided by the nurses at the school with an on-site clinic. Nonetheless, the rate of recurrent disease and apparent failure of preventive care are disturbing. Clearly more attention needs to be paid to prevention, especially in high-risk patients. A large proportion of Singaporean children are afraid (Chellappah *et al*). Identification of these children is important, to enable suitable management techniques to be incorporated early in the dental treatment process. Further work examining fear levels in older children in relation to oral health and the seeking of care is expected in the near future.

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CORRELATING S. *MUTANS* WITH DENTAL CARIES

The present study used a clinically applicable microbiological method to correlate *Streptococcus mutans* counts and dental caries prevalence in young children. The study population consisted of 37 subjects, between 16 and 60 months of age. Using a sterile tongue depressor, samples of unstimulated saliva were obtained from subjects and inoculated onto elevated agar plates containing a selective medium. Plates were incubated anaerobically at 37°C for 48 h. χ^2 and multiple regression analyses gave highly significant relationships ($p<0.01$) between dental caries prevalence and the number of *S. mutans* colonies.

Weinberger, S.J. *et al.*: Correlating *Streptococcus mutans* with dental caries in young children using a clinically applicable microbiological method. Caries Res, 23:385–388, September-October, 1989.

ABSTRACTS

Dilley, Diane C.; Vann, William F., Jr.; Oldenburg, Theodore R.; Crisp, Roslyn M: Time required for placement of composite versus amalgam restorations. J Dent Child, 57:177-183, May-June, 1990.

This study was designed to develop an indirect method for measuring the time required for restoration placement; and to compare the operator time required for placement of amalgam and composite resins in posterior teeth in children. Forty children, aged seven to nine years old, were selected to participate. Either amalgam or an experimental resin was used to restore the primary and permanent molars. All restorations and sealants were completed under the rubber dam. Each restorative appointment was videotaped with a color video camera mounted on the ceiling. Ninety-six restorative procedures were reviewed and evaluated for the amount of time necessary to accomplish them. The Class I permanent molar composite restoration required 35 percent more insertion and finishing time than did the amalgam.

Restoration, composite [and] amalgam; Placement times; Videotape; Pediatric dentistry

Hickel, Reinhard and Voss, Axel: A comparison of glass cermet cement and amalgam restorations in primary molars. J Dent Child, 57:184-188, May-June, 1990.

The aim of this clinical study was to compare the efficacy of GCC with amalgam as a filling material in primary molars. Two hundred fifteen restorations were placed in the first and second primary molars of seventy-four patients, ranging in age from four to ten years. The overall failure rate of amalgam is lower than that of GCC, but not significantly different. In older children, amalgam has greater advantages. An advantage of GCC is the short time required to fill the cavity. This might be an important factor in young and/or difficult children. In these cases amalgam cannot be placed under optimal conditions and, therefore, the results are less satisfactory. GCC is a viable alternative filling material.

Restorations, Class I [and] Class II; Amalgam; Cement, glass cermet; Pediatric dentistry

Abraham, James; Stiles, H.M.; Kammerman, Lisa A.; Forrester, Donald: Assessing periodontal pathogens in children with varying levels of oral hygiene. J Dent Child, 57:189-193, May-June, 1990.

This study investigated the presence of organisms *Actinobacillus actinomycetecomitans (A.a.), Bacteroides intermedius (B.i.),* and *Bacterioides gingivalis (B.g.),* believed to be associated with periodontal disease etiology in children. The study included fifty children, aged six to fourteen years, selected from patients seeking routine dental care at Children's Hospital National Medical Center. A Modified Plaque Index (MPI) denoting the clinical presence and severity of the periodontal disease was obtained for each patient and ranged from 0-3. A total of 200 samples were obtained from the gingival crevice of the mesial surface of all first permanent molars and tested with DNA probes for the presence of three microorganisms. No correlations were found between race, sex, age, and the Modified Plaque Index. The results show that *A. actinomycetecomitans* was found only in patients with MPI ≥ 1. *B. gingivalis* was present only in combination with another organism.

Periodontal disease; DNA probe technology; Modified Plaque Index; Microorganisms

Waldman, H. Barry: A litany for change. J Dent Child, 57:194-197, May-June, 1990.

A listing of the health and social needs of children is provided in an attempt to stimulate a demand for increased attention to youth of our country. Child abuse, violence, infant mortality, health care disparity and lack of insurance, working parents, poverty, adverse living conditions and arrangements, and increasing numbers of disadvantaged and/or minority children are some of the most pressing needs facing the youngest segment of our society today.

Health concerns; Sociologic issues; Children, minority [and] disadvantaged; Child abuse; Health and welfare

Waldman, H. Barry: Is there a future for pediatric dentistry? Reviewing the other side of the story. J Dent Child, 57:198-202, May-June, 1990.

A combination of the improving oral health of children; a decreasing percentage of the population that is younger than eighteen years of age; and increasing numbers of pediatric dentists all seem to augur poorly for the future of pediatric dental practice. But there is another, more favorable side to the story: many health and dental services are needed; there is corresponding impact on the well-being of children.

Child health; Oral health; Pediatric dentistry; Dental economics; Census reports

Ranalli, Dennis N.; Guzman, Rolando; Schmutz, John A.: Craniofacial and intraoral manifestations of congenital hemifacial hyperplasia: report of case. J Dent Child, 57:203-208, May-June, 1990.

The craniofacial and intraoral developmental and morphologic characteristics of the rare congenital disorder known as hemifacial hyperplasia are reviewed. The case of a 7.7-year-old Caucasian girl affected by this malformation is presented to corroborate and supplement existing clinical knowledge regarding hemifacial hyperplasia.

Suggestions are made regarding the implications of early differential diagnosis and treatment planning of affected individuals. Special emphasis is placed on the advantage of multidisciplinary team management.
Anomalies, craniofacial [and] intraoral; Hyperplasia, hemifacial

Solares, Roberto: The complications of late diagnosis of anterior supernumerary teeth: case report. J Dent Child, 57:209-211, May-June, 1990.
This case report is unusual for two reasons: diagnosis of anterior supernumerary teeth was made in a boy who was fourteen, much later than is usual; and the extremely negligent attitude of both parent and child in seeking regular dental care was a contributing, complicating factor.
Supernumerary teeth; Diagnosis, late

Fadavi, Shahrbanoo and Rowold, Elisabeth: Familial hypophosphatemic vitamin D-resistant rickets: review of the literature and report of case. J Dent Child, 57:212-215, May-June, 1990.
Familial hypophosphatemia, commonly known as vitamin D-resistant rickets, is inherited in an x-linked dominant manner. This condition is characterized by impairment of renal tubular reabsorption of inorganic phosphate and is inherited as a sexlinked dominant trait. Early clinical signs, usually detected about two years of age, included lateral bowing of the lower extremities, scoliosis, and frontal bossing. Characteristic dental findings are often the first clinically noticeable signs of the disease. This case report describes the typical dental findings in a 10-year old Hispanic female.
Rickets, vitamin D-resistant; Hypophosphatemia

Topper, Daniel C.; Zallen, Richard D.; Kluender, Randy L.: A dental and facial anomaly not previously reported with VACTERL association: report of case. J Dent Child, 57:216-219, May-June, 1990.
VACTERL association is an acronym for a rare combination of symptoms including *V*ertebral defects, *A*nal atresia, *C*ardiac abnormalities, *T*racheo-*E*sophageal fistula, *R*enal abnormalities, and *L*imb deformities. A case is presented of a patient with documented VACTERL association with a dental anomaly and possible hemifacial microsomia. The literature on VACTERL association is reviewed and an argument made for the possible changing of the acronym to VACTERL-DF to recognize the dentofacial anomalies.
Syndromes; Etiology; Anomalies, dento-facial; Birth defects; Microsomia, hemifacial

Morisaki, Ichijiro; Abe, Keiko; Tong, L.S.M.; Kato, Kazuo; Sobue, Shizuo: Dental findings of children with biliary atresia: report of seven cases. J Dent Child, 57:220-223, May-June, 1990.
Patients with congenital biliary atresia (CBA) showed green staining of the teeth and soft tissues. Current cases of biliary atresia show various degrees of green staining in the primary and/or permanent dentition, suggesting a correlation between the degree of staining and the severity of the disease. Rampant caries was found in five out of seven patients. The importance of meticulous oral hygiene should be emphasized.
Biliary atresia, congenital; Jaundice, infantile; Dental care

Vignehsa, Hema; Chellappah, N.K.; Milgrom, Peter; Going, Robert; Teo, Choo Soo: A clinical evaluation of high- and low-fear children in Singapore. J Dent Child, 57:224-228, May-June, 1990.
Few studies have investigated the effects of fear of the dentist on oral health and quality of care. In this study the oral health of 114 fearful and nonfearful children aged ten to fourteen years, in two representative Singaporean primary schools is compared. Further, the hypothesis that poorer quality of care is provided to fearful children as a result of management problems, is tested. Although there was a significant difference in quality of restorations provided in the different schools, the hypothesis that more fearful children would be in poorer oral health or obtain poorer dental care was not supported. It is postulated that the poor management of fear at this age may result in avoidance when the children are no longer part of a school-based delivery system.
Anxiety; Dental fear; Caries; Oral health; Delivery, dental care; Singapore

LETTERS

Thank you

When I agreed, in December 1988, with the request of our associate editors, Donald Kohn and Jimmy Pinkham, that they assume responsibility for constructing the January-February 1990 issue of JDC, I expected that they contemplated the opportunity primarily as a training exercise. It did not occur to me that they seized it as an opportunity to honor me for whatever I may have contributed to pediatric dentistry as editor of JDC.

As usual, several people contributed to the construction of the issue, but major credit must go to Jimmy and Donald; and to John Goetz who used his exceptionally fine talents in design and composition to produce a special issue; to Sharlene Nowak-Stellmach who produced the beautiful cover; to the authors who wrote caretaking reviews and analyses of special areas of pediatric dentistry covered by JDC during the last twenty-two years: in addition to Jimmy and Donald, Marty Davis, Henry Fields, Art Nowak, and Barry Waldman; and to my esteemed and be-

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