CDA

Mental Retardation
Attention Deficit
Autism

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MANAGING MEDICAL AND BEHAVIORAL CHALLENGES IN CHILDREN

John A. Vagiela, DDS, PhD

OF THE CALIFORNIA DENTAL ASSOCIATION

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Protecting the Public: Myth or Reality?

The 2002 California Dental Association House of Delegates passed a resolution requesting that the Council on Education and Professional Relations establish a task force to study the California licensure examination and alternatives and file a report to the 2003 house.

Last month, we commented in this space about some of the problems surrounding the clinical examination that have surfaced in recent years. Many in the profession have raised questions about the purpose and rationale for the clinical licensure examination given these increasing concerns.

As a result of the aforementioned CDA house action, a task force on clinical licensure evaluation was appointed to study the issues and to consider potential alternatives to address the concerns here in California. We recently had the opportunity to hear some of the expert testimony presented to the task force and believe that discussion of a couple issues is relevant at this time. While some options involving changes in the examination were aired, it is premature to discuss them at this time.

We believe that the purpose of the clinical exam should be at the center of the discussions. Many within the profession, including dental examiners, have believed for years that the examination helps to determine whether a candidate possesses the skills or abilities to provide competent treatment to patients. They fervently believe that a function or goal of board examinations is protection of the public.

Testimony to the task force provided data showing that 98 percent of candidates pass the California clinical exam and are licensed within one year. However, the task force learned that no data exists supporting a conclusion that this significant majority of candidates who successfully passed the clinical examination will continuously provide the competent care that will protect the public. A one-shot exam or evaluation in any discipline is considered a "snapshot" in time. It reflects what the performance was at the time of the examination but can tell nothing about the current or future performance in practice.

Therefore, a question has been raised that we believe has some merit: "Is the achievement of protection of the public through clinical licensure examination a myth or a reality?" Does a single snapshot of a candidate's restorative skills or clinical judgment as measured by a Dental Board clinical examination after graduation ensure that the dentist will either immediately or continuously throughout his or her career provide competent care to the public? The response to this question, whether positive or negative, is little more than an assumption due to lack of data that tracks career clinician performance.

One of the experts, Dr. David Chambers of the University of the Pacific,

A one-shot exam reflects what the performance was at the time of the examination but can tell nothing about the current or future performance in practice.

stated that research data shows that "Increasingly, dentistry is about managing patients and their oral health over extended periods of time. In particular, the one-shot evaluation format is limited to testing one-shot tasks. No matter how well-designed, a test of one-shot performance will not be able to measure the large realm of dental practice behaviors that occur in context and over time." Additional testimony showed that reliability of dental board exams is well below the standard necessary to predict ability and that performance and ability are not the same.

We must also consider another longstanding part of the controversy surrounding licensure exams: whether passage of the current clinical examination by newly trained specialists provides any evidence that these practitioners will provide competent treatment to the public *in their specialty* as a result of their performance on the rather narrow skill areas that make up current board examinations. Again, due to the lack of any data about practitioner career performance trends, we cannot assume that a one-shot board licensure exam will accurately predict that either generalists or specialists who are successful on the licensing examination will be able to consistently deliver competent care.

Further, we suggest that there really are two issues involved that would be best separated. One, as discussed last month, is the need to eliminate deficiencies in the current licensure *process* in California. These problems are negatively affecting the lives of the newer members of our profession and deserve immediate attention. The other issue relative to dental licensure exams in general (not just the board examination in California) is to determine what reliable mechanism(s) can be developed to evaluate the ability of practitioners to ensure that the public is protected from incompetent dental care. While solutions to the concerns surrounding these two issues might at some point be connected, we believe that it is necessary to address them separately.

What might it take to ensure that the goal of protection of the public becomes an achievable reality? Those knowledgeable on the issue, such as Dr. Chambers, believe that a "portfolio" approach, where dentist ability can be measured on a continuing basis over time in the dental curriculum, may be the most practical methodology to consider. It is believed that trends in practitioner performance and behavior are essential to measure or determine competency. This might again raise the concept of "continuing competency," which has been a topic of considerable controversy within the profession in the past.

As we mentioned here last month, resolution of the deficiencies in the current licensing process should be the first order of business and will require cooperation from all affected parties, which includes the Dental Board, the California Dental Association, and the California dental schools.

The issues of protecting the public and the continuing competency of licentiates in providing care are also deserving of the cooperative discussion of all parties if evaluation measures that will protect the public are to become a reality. This issue extends well beyond the California state line. It is an issue that deserves the attention of the profession throughout the country. CDA

Resolution of the deficiencies in the current licensing process should be the first order of business.

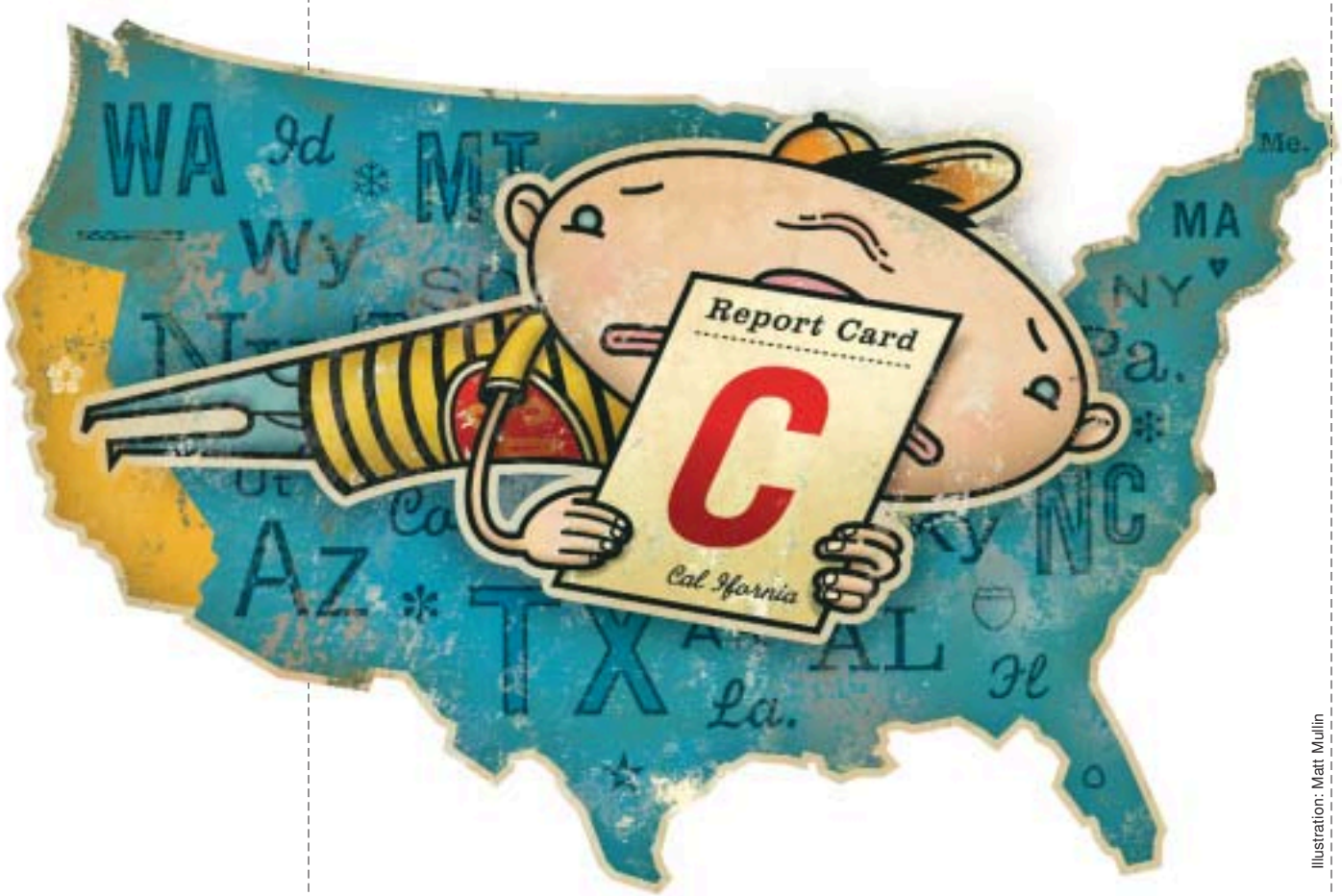


Illustration: Matt Mullin

California, U.S. Show No Improvement on Report Card

The nation's progress in improving oral health has stagnated, according to the latest national report card released by the advocacy group Oral Health America. The United States received lackluster grades in areas from oral health access and prevention to policies and infrastructure, contributing to an overall grade of C on the report card. California also received an overall grade of C.

The nation's oral heath affects everything from school attendance to combat readiness, Oral Health America noted. "The armed forces are spending a disproportionate share of medical resources to treat the dental problems of new recruits before they can be deployed," according to the report card.

"We can treat the symptoms now or be stuck with a painful toothache for years to come."

ROBERT KLAUS
PRESIDENT,
ORAL HEALTH AMERICA

Holding the nation back is access to care, which received a C-. In some states, dentist availability was a major concern. A toothache in Nevada — one of two states to receive an F for dentist availability — might need to be treated in neighboring California, one of only nine states to earn an A. Nevada is working to improve, having recently opened the state's first dental college.

The report card also found that those in the greatest need are having the hardest time finding care, as 18 states received Fs for availability of dentists who provide significant services under Medicaid, contributing to an alarming D for the nation. The report notes that adults are three times as likely to be without dental insurance as medical insurance. In half of all states, Medicaid either provides only for emergency dental care or provides no coverage at all.

"We can treat the symptoms now or be stuck with a painful toothache for years to come," said Robert Klaus, president of Oral Health America. "In the end, it is far less costly to provide access to routine dental care than to allow easily treatable problems to balloon into major medical emergencies."

The report found that basic preventive measures fall short of national goals. Several areas where significant progress can still be made were highlighted, including:

- Adequate fluoridation of public water supplies, the most cost-effective disease prevention strategy, is unavailable to more than 100 million Americans.
- Dental sealants are found in only 23 percent of youth younger than 8 and in less than 10 percent of low-income minority children.
- The nation received a D for policies to reduce the use of smokeless tobacco.
- Most older Americans, at high risk for oral health problems, have no dental insurance. Thirty-two states received Ds or Fs for having more than 70 percent of their elderly report having no dental insurance. Medicare provides no routine dental coverage.

The report did find some bright spots. States made inroads against oral and pharyngeal cancer, as the nation received a B for reducing mortality rates associated with the disease during the past 26 years. Also encouraging were the 27 A's received by states for leadership, indicating that many of the right steps toward progress are in place.

Overall, the highest marks went to Connecticut, Ohio, Vermont, and Wisconsin at B-. Montana needed the most dental work, barely passing with a D. Four states — Kansas, Louisiana, Mississippi, and South Dakota — were not far ahead with a D+.

"The purpose of the report card is to highlight the critical need for improved oral health for many Americans," Klaus said. "The reality is that each state and the nation can make the honor roll by focusing resources and utilizing effective disease prevention measures."

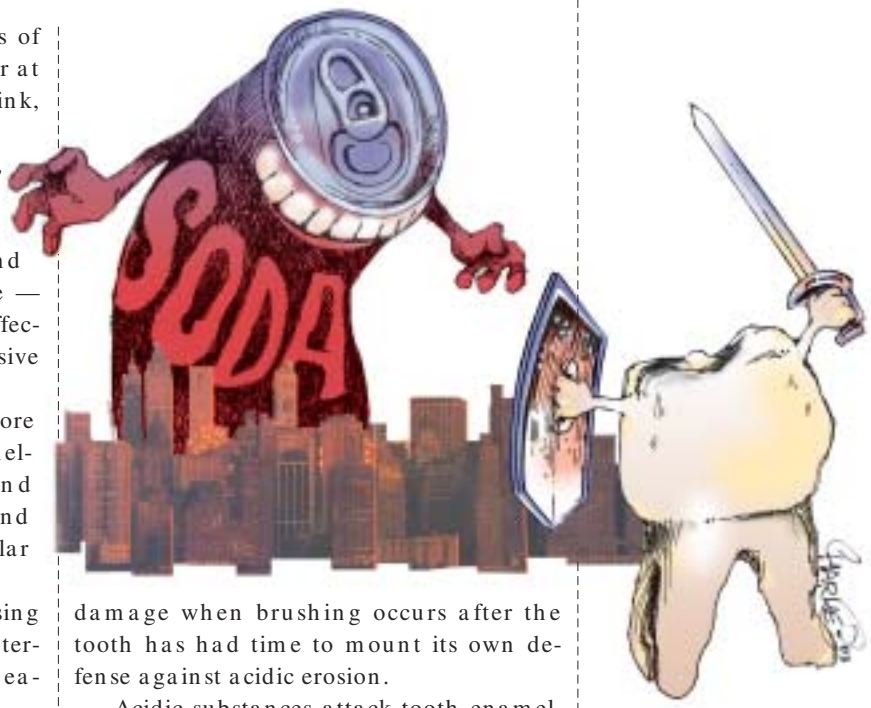
The National Grading Report was funded in part by a generous grant from the Robert Wood Johnson Foundation. Full report card results are available by visiting www.oralhealthamerica.org.

California's 2003 Report Card

Prevention	C
Access (dentist availability)	B
Access (Medicaid providers)	B
Health status	B-
Policies	C
Final grade	**C**

Note: *The categories for grading have changed since the first Oral Health Report Card was issued in 2000, so no direct comparison is available. California's overall grades in 2000 and 2002 were also C.*

Brushing Right After Drinking Soda May Harm Teeth



The best defense against the effects of soda on the teeth is to brush, but not for at least 30 minutes after finishing the drink, according to new research.

Dentists at Goettingen University, Germany, conducted a study to determine the best time to brush after drinking carbonated beverages. They found that later — rather than immediate — brushing is three to five times more effective at protecting enamel from the erosive effects of carbonated drinks.

For three weeks, eleven volunteers wore removable prostheses made of an enamel-like substance. Each morning and evening, the prostheses were removed and soaked for 90 seconds in a liquid similar in acidity to soda.

The prosthesis was then brushed using an electric toothbrush after different intervals. After three weeks, researchers measured the thickness of the enamel.

Professor Thomas Attin, director of the university's department for tooth protection, preventive dentistry, and periodontology, said, "The loss of material was less when the participants waited with cleaning for between 30 and 60 minutes."

Attin presented the research at the annual meeting of the German Association for Tooth Protection.

He said enamel appears to suffer less damage when brushing occurs after the tooth has had time to mount its own defense against acidic erosion.

Acidic substances attack tooth enamel, he said, and upper layers of the tooth can even be dissolved in some acidic drinks. However, protective agents in saliva may help repair and rebuild damaged tooth enamel.

Waiting before brushing seems to give the teeth a chance to rebuild, the researchers said, while immediate cleaning of such teeth can increase the damage by brushing off the affected layers.

Smoking and Stress: Which Begets Which?

The connection between stress and smoking is a bit like the chicken and the egg. Some research suggests that people begin and continue smoking because of the stress in their lives. In fact, smokers often say that stress makes them smoke more and that smoking calms them. Other research, however, suggests people may be stressed because they smoke. Studies showing decreased stress among people who've stopped smoking help bolster this claim. There's also the role of nicotine to consider. Does smoking a cigarette really reduce stress, as many smokers claim? Or does it just provide temporary relief from the symptoms of nicotine withdrawal, such as feelings of stress, anger and irritability? Many scientists argue the latter.

From the May 2003 issue of HealthQuest, newsletter of the Mayo Clinic.

Few Depressed Americans Receive Adequate Treatment

Millions of Americans suffer from major depression each year, and most are not getting proper treatment for this debilitating disorder, according to a two-year nationwide study reported in the June 18 *Journal of the American Medical Association*.

The study, led by researchers from Harvard Medical School, found high rates of major depressive episodes in all segments of the U.S. population. The researchers measured the severity and duration of depression in more than 9,000 Americans 18 years or older and looked at the effect major depressive episodes had on daily activities and treatment received, if any.

"This is the first study to assess clinical severity of depression in a community sample," said survey leader Ronald Kessler, Harvard professor of health care policy.

"Critics have suggested that depression was overestimated in earlier studies because of many people with mild depression being included even though they really don't need treatment," Kessler said. "But we built in a state-of-the-art clinical severity assessment; and we found that the majority of people with major depressive episodes are severe cases, and only a small minority are mild cases. The average person with major depressive episodes in the past year reported an average of 35 days when they were unable to work or carry out other normal activities because of their depression.

"These findings confirm that depression is an enormous societal problem, both in terms of the number of people involved and in terms of clinical severity," Kessler said.

Although most people reporting depression in the past 12 months received some kind of treatment — an improvement over earlier findings — only one in five received treatment that met minimum standards of adequacy established by the Agency for Health Care Policy and Research.

The researchers found that this problem of inadequate treatment was due to a mix of inappropriate dosing of antidepressant medications on the part of physicians, patient discontinuation of treatment, and the use of unproven treatments outside the medical and mental health system.

"While recently increased treatment is encouraging, inadequate treatment is a serious concern," Kessler and his co-authors wrote. "Emphasis on screening and expansion of treatment need to be accompanied by a parallel emphasis on treatment quality improvement."

The researchers found that major depressive episodes affect 13 million to 14 million American adults each year.

Top 10 health risks for men

Each year millions of men die of conditions that are by and large preventable. The current leading causes of death in American men are:

1. Heart disease
2. Cancer
3. Stroke
4. Accidents
5. Chronic lower respiratory diseases
6. Diabetes
7. Influenza
8. Suicide
9. Kidney disease
10. Chronic liver disease and cirrhosis.

From the May 2003 issue of HealthQuest, newsletter of the Mayo Clinic.

Mouse Model Mimics Human Dental Disorder

A team led by scientists at the National Institute of Dental and Craniofacial Research has created a mouse model with tooth defects similar to those of people with dentinogenesis imperfecta III. The model will allow scientists to learn more about how the hereditary disorder arises and provides a tool for developing and testing treatments. The researchers reported their findings in the July 4 issue of the *Journal of Biological Chemistry*.

Dr. Ashok Kulkarni and his colleagues created the mouse model by deleting the dentin sialophosphoprotein gene, which is thought to be responsible for coordinating the mineralization of a tooth's dentin. The animals' teeth showed discoloration, large pulp cavities, and pulp exposure. Detailed studies of the teeth revealed abnormalities in the dentin.

"Our study shows that (the gene) plays a key role in orchestrating the process of dentin mineralization, or maturation," said senior author Kulkarni, from the NIDCR Functional Genomics Unit and Gene Targeting Facility. "This mouse model shows for the first time some of the molecular events regulated by (the gene) that are involved in dentin mineralization."

Dentin formation requires several steps: First, dentin-forming cells secrete the proteins that make up dentin's scaffolding. Mineralization occurs as dentin hardens when calcium is deposited onto this framework. The areas that are first to mineralize grow and then fuse to create one calcified mass that is the mature dentin.

Dentinogenesis imperfecta, classified into three subtypes, occurs in about 1 in 8,000 newborns in the United States. The teeth can be bluish or brownish with a somewhat translucent appearance. On X-ray, the teeth appear as "shell teeth," with a layer of enamel, a thin layer of dentin, and very large pulp chambers. Because of the unstable dentin, the enamel can shear off and expose the dentin, which could then wear down to the pulp. Most people severely affected with dentinogenesis imperfecta III are candidates for dentures or implants by age 30 despite dental intervention.

Upcoming Meetings

2003

Oct. 23-26	ADA Annual Session, San Francisco, (800) 232-1432.
Nov. 2-7	U.S. Dental Tennis Association Annual Meeting, Palm Desert, Calif., (800) 445-2524.
Nov. 8-9	International Conference on Evidence-Based Dentistry, Chicago, j.ryley@elsevier.com.
Nov. 16-22	Annual Meeting of the United States Dental Golf Association, Scottsdale, Ariz, (631) 361-7127, usdga@optonline.net.
Dec. 5-7	California Academy of General Dentistry Annual Meeting, San Diego, (877) 408-0738, www.cagd.org.

2004

March 3-6	Academy of Laser Dentistry 11th Annual Conference, Palm Springs, Calif., (954) 346-3776, www.laserdentistry.org.
April 15-18	CDA Spring Scientific Session, Anaheim, (916) 443-3382, Ext., 4470.
Sept. 8-11	International Federation of Endodontic Associations Sixth Endodontic World Congress, Brisbane, Queensland, Australia, www.ifea2004.im.com.au.
Sept. 10-12	CDA Fall Scientific Session, San Francisco, (916) 443-3382, Ext. 4470.
Sept. 30-Oct. 3	ADA Annual Session, Orlando, Fla., (312) 440-2500.

To have an event included on this list of nonprofit association meetings, please send the information to Upcoming Meetings, *CDA Journal,* P.O. Box 13749, Sacramento, CA 95853 or fax the information to (916) 443-2943.

The Nondental Management of Pediatric Dental Patients

John A. Yagiela, DDS, PhD

In the February issue of this journal, coincident with that month's designation as National Children's Dental Health Month, Dr. James Crall highlighted demographic challenges we face in meeting the health needs of California children.[1] Among the statistics cited by Dr. Crall were the following:

- A total of 4.36 million low-income children live in California, representing one-sixth of the United States total;
- More than half of all California school-aged children have untreated decayed teeth, a prevalence more than twice the national average; and
- Preschool and elementary schoolchildren in California have higher rates of caries than other age groups.

Until such time as effective preventive measures against caries are uniformly available and practiced, primary care dentists in California will bear the burden of treating caries and its sequellae in these children.

Dr. Crall also commented on the availability of dental personnel in the state, their distribution, and their participation in the Medicaid (Denti-Cal) program. Besides such barriers to care as the maldistribution of dentists in the state, low Medicaid reimbursement rates for treatment, and a state deficit with potentially dire consequences for the public oral health care delivery system, many dentists harbor reservations about treating children. These reservations are often linked, not with the necessary dental procedures to be performed, but with concerns pertaining to medical conditions children may have and behavioral challenges they may pose. The central theme for this month is "The Nondental Management of Pediatric Dental Patients." It is hoped that the information presented on this subject will help improve access to care by enabling more dentists to treat a wider variety of children more effectively and safely.

Three articles in this issue, by Dr. Arthur Friedlander and colleagues, discuss specific disorders that raise behavioral management issues for dentists and require specific adjustments to dental care. The first paper describes the medical management and dental implications of attention-deficit hyperactivity disorder. This condition, particularly common in males, is believed to be the most common neurobehavioral disorder among school-aged children. Dentists can provide the full range of dental services for these patients with appropriate consultation and recommendations detailed in this paper.

The second article by Friedlander and associates reviews the dental patient with autism. Autism is a neurobehavioral and cognitive disorder that presents significant challenges to both patient and caregivers, especially in social settings. With an apparently sustained increase in prevalence over the past two decades, autism will continue to evolve as a growing challenge for dentists.

Fragile X, Rett, and Prader-Willi syndromes are described in the third article by Friedlander and colleagues collectively as the most common inherited genetic disorders leading to mental retardation. Dental management of these individuals requires a working knowledge of the medical and behavioral deficits they pose and how dental care can be modified to accommodate them.

Drs. Clarice Law and Stephen Blain review, in the fourth paper of this series, nonpharmacologic behavior management strategies that have proved useful in treating young children and older patients with varying degrees of developmental delay. Although "precooperative" children and the more severely retarded patients may require conscious sedation or general anesthesia for even minimally invasive procedures, a fundamental understanding of the determinants that influence patient behavior permits the dentist to select and use behavior management strategies appropriate for specific patients.

It is expected that subsequent issues of the *Journal* will further review medical issues surrounding the treatment of pediatric dental patients. CDA

References / 1. Crall JJ, California children and oral health: Trends and challenges. *J Calif Dent Assoc* 31:125-8, 2003.

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The Pathophysiology, Medical Management, and Dental Implications of Children and Young Adults Having Attention-Deficit Hyperactivity Disorder

Arthur H. Friedlander, DDS; John A. Yagiela, DDS, PhD; Victoria I. Paterno, MD; and Michael E. Mahler, MD

ABSTRACT

Attention-deficit hyperactivity disorder is considered to be the most common neurobehavioral disorder among school-aged children. Children who have ADHD exhibit symptoms of inattention, hyperactivity, and impulsivity that are extreme for their age. These symptoms adversely affect academic performance, vocational success, and social-emotional development. The disorder is usually treated with stimulant medications, but on occasion antidepressants and certain antihypertensive agents are used. Dentists caring for individuals with ADHD must be familiar with the manifestations of the disease and its associated features so they can garner the maximum level of cooperation from the patient. They must also be familiar with the drugs used to treat the disorder because many of these pharmaceuticals cause adverse orofacial and systemic reactions and may interact with dental therapeutic agents.

Attention-deficit hyperactivity disorder is a lifelong behavioral illness that often becomes apparent before age 7. Classified innumerable ways (mental illness, neurodevelopment disorder, neuropsychological disorder, behavioral illness), ADHD is characterized by a persistent pattern of inattention and/or hyperactivity and impulsivity that impairs school and occupational activities and social interactions.[1]

Inattention is evident in preschoolers with ADHD when they appear to

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be daydreaming and when they seem not to listen or hear what was just said. As they get older and enter school, class work is done carelessly, and homework is performed without considered thought. Homework may also go uncompleted because of their inability to persist with the task and their easy distractibility by such things as a car honking outside or students talking in the next room. As teenagers and young adults, they avoid tasks requiring sustained mental effort and organizational skills and are often forgetful (e.g., missing appointments). In social situations, inattention is expressed as they appear distracted during conversations or do not follow the rules of games and activities.

Hyperactivity is evident in preschoolers when they appear to run continually back and forth, jump or climb on furniture, and have difficulty participating in sedentary group activities such as listening to a story. As they get older and enter school, they have difficulty remaining seated, fidget with objects, tap their hands, and shake their feet or legs excessively. They also often get up from the table when doing homework, walk around, and talk excessively. As teenagers and young adults, they have difficulty engaging in quiet activities and complain of feeling restless.

Impulsivity manifests in young children as impatience and difficulty in waiting their turn. In school, children with ADHD blurt out answers before questions have been completed, frequently interrupt their classmates, and fail to listen to directions. As teenagers and young adults they interrupt others excessively, grab objects from others, and engage in potentially dangerous activities without consideration of possible consequences (e.g., repeatedly climb to precarious positions or ride a skateboard over extremely rough terrain).

In addition to the behavioral problems encountered at school, these children also often have learning disabilities in reading, spelling, and math.[2] Some also have problems verbally expressing themselves and understanding what others have said. This deficit often results in their having a low scholastic average, being held back in school, and graduating from high school at a rate (68 percent) far below the national average (95 percent).[3] Speech problems, reduced stamina and strength in physical fitness tests, motor incoordination, and a predisposition for accidental injury are also more prevalent in these children than in those without the disorder. Academic failures and skill deficits often lead to demoralization and poor self-esteem.[4,5]

> They are only aware that their teachers and/or classmates are always yelling at them and ascribe it to meanness, not realizing that what they do elicits the yelling.

Symptoms of ADHD are usually exacerbated by stress, by unstructured situations, by group situations, and by demands for complex performance. Many children with ADHD are not cognizant of their deficits and have little insight; they are only aware that their teachers and/or classmates are always yelling at them and ascribe it to meanness, not realizing that what they do elicits the yelling. Similarly, family relationships suffer because others believe that the behaviors associated with ADHD are deliberate or merely signs of laziness.[6,7]

The diagnosis of ADHD is based on a behavioral history obtained from parents/caretakers and teachers, and medical, psychological, and educational tests.[8] To assist parents and other responsible parties in identifying the aforementioned symptoms, they are often asked to fill out symptom check lists or standardized rating scales, such as the Achenbach Child Behavior Check List.[9] The clinician then weighs the reliability and validity of the historians, elicits information about modifying circumstances, explores alternative explanations for the presence of the symptoms (i.e., bipolar disorder, learning disabilities, anxiety, Gilles de la Tourette's syndrome), and then arrives at the diagnosis. There are no specific medical or laboratory tests available to confirm the diagnosis.[10]

Epidemiology

The prevalence of ADHD is estimated to be between 3 percent and 5 percent in school-aged children, with boys outnumbering girls by a 3:1 ratio.[11,12] Most children (60 percent) exhibit symptoms of both inattention and hyperactivity-impulsivity. However, in approximately 25 percent of individuals, inattention is the predominant symptom; and it is often accompanied by reduced speed in cognitive processing and responding.[13,14] In the remaining 15 percent of individuals, hyperactivity and impulsivity are the predominant symptoms; and they are accompanied on occasion (usually in middle school or high school) by abuse of alcohol and illicit substances.[15]

Associated Disorders and Risk Factors

A substantial portion (greater than 40 percent) of children with the combined form of ADHD and the type whose predominate symptom is hyperactivity-impulsivity also suffer from oppositional defiant disorder. ODD is characterized by a recurrent pattern of negativistic (resentful), defiant (argues with adults), disobedient (refuses to comply with adults' requests), and hostile (spiteful and vindictive) behavior toward authority figures. Large numbers (25 percent) of children with the combined form of ADHD and the type whose predominant symptom is hyperactivity-impulsive also suffer from conduct disorder. CD manifests as a repetitive and persistent pattern of behavior in which the basic rights of others or major societal rules are violated (e.g., aggression to people and animals, and destruction or theft of property). ADHD and CD may also interact to afford a higher risk for substance abuse than either disorder alone.[16] Boys are twice as likely as girls to suffer either ODD or CD.[17] The behaviors seen in both of these accompanying disorders probably arise because ADHD impairs the ability of these individuals to self-regulate mood states like anger and hostility. Approximately 18 percent of individuals with ADHD also develop depression (seen more commonly in the combined and inattentive types), 25 percent have an anxiety disorder (seen mainly in the inattentive type), and 30 percent have a learning disorder (also most common in the inattentive type).[18]

Genetics and Etiology

The exact cause of ADHD remains unknown, although most hypotheses focus on abnormal brain function of genetic origin.[19] The monozygotic (identical) twin of a child with ADHD (with essentially identical genes) has a greater than 90 percent chance of having the disorder. The dizygotic (fraternal) twin of a child with ADHD (who shares half of the genes) has a 33 percent chance of developing ADHD.[20] Siblings and first-degree relatives of children with ADHD are five times more likely to suffer the disorder then are nonrelatives.

Many of the mechanisms believed responsible for the symptoms of ADHD have recently been identified by brain imaging studies and responses to medication.

The fathers of children with ADHD have high rates of alcoholism, antisocial personalities, mood disorders, and anxiety disorders, and they likely suffered as children from ADHD, ODD, or CD.[21] In fact, approximately one-third of these men still suffer from ADHD, with the most prominent symptoms being restlessness, distractibility, and impulsivity. The mothers of children with ADHD often exhibit Briquet's syndrome, which is characterized by alcoholism and multiple somatic complaints seemingly related to anxiety or other psychological factors. Other anxiety disorders and depression are also rife within these families.

Many of the mechanisms believed responsible for the symptoms of

ADHD have recently been identified by brain imaging studies and responses to medication. Anatomic brain imaging studies have shown that most youngsters with the disorder have smaller total cerebral volumes and specific significant reductions in both gray and white matter in the frontal lobes.[22] Functional brain imaging studies also demonstrate that these children exhibit reduced global activation and reduced local activation of the basal ganglia and anterior frontal lobe.[23,24] These areas of the brain are involved with executive functions, such as impulse control (self-regulation), organization and planning, sustained goal directed activities, and socially responsive behavior.[25] The administration of stimulant medications activates these areas.[26] An imbalance of the neurotransmitters dopamine and norepinephrine in the prefrontal cortex of the brain is also believed by some to be responsible for such symptoms as inattention, lack of alertness, and impaired planning and working memory.[27] The administration of stimulants and certain tricyclic antidepressants appears to increase the activities of these neurotransmitters in the brain, thereby ameliorating these symptoms.[28,29]

Medical Management

Management of ADHD almost always includes pharmacotherapy and may also include behavior therapy.[30,31] Stimulant medications (methylphenidate, amphetamine and dextroamphetamine[a]) are most commonly used (75 percent) to treat ADHD in children.[32] In fact, it is estimated that 3 million children (including 1.2 percent of the preschool population) and adolescents in the United States take these medications daily.[33,34]

Stimulant medications increase the active concentrations of dopamine and norepinephrine in the brain stem, midbrain, and frontal cortex, thereby increasing the child's attention span and concentration ability and reducing hyperactivity and impulsivity.[35-38] These medications also improve academic performance (short-term memory, reaction time, math computation, problem-solving, task persistence, handwriting), fine motor speed, coordination, parent-child interactions, social and classroom behaviors, aggression, oppositionality, mood, and peer relations.[39,40] In addition, children with ADHD who are treated with stimulants are less likely to abuse substances (tobacco, other stimulants, glue inhalants, opioids) and alcohol than are peers who have the disorder but remain unmedicated.[41,42] Some researchers have also postulated that stimulant control of the core ADHD symptoms permits behavioral and psychological treatments to address more effectively the learning problems, reduced social skills, and low self-esteem that are refractory to medication. Stimulant medications are effective in 75 percent to 95 percent of patients and often lead to improvements that permit normal behavior.[43] Side effects are usually mild and consist of slight elevations in diastolic and systolic blood pressure and pulse rate, anorexia and weight loss, sleep disturbances, and transient motor tics.

> These medications are particularly effective in relieving inattention and hyperactivity but may not address impulsivity.

Antidepressants are prescribed for children with ADHD who respond poorly to stimulants, experience unacceptable side effects, or have severe concomitant disorders such as depression, anxiety, or a tic disorder.[44] The tricyclic antidepressants have proved most effective, specifically those TCAs (e.g., desipramine and imipramine) that increase concentrations of norepinephrine in the synaptic cleft. These medications are particularly effective in relieving inattention and hyperactivity but may not address impulsivity. Use of TCAs (especially imipramine) is associated with significant anticholinergic effects (e.g., dry mouth and constipation) and postural hypotension. The atypical antidepressant bupropion is also used to treat ADHD and is also especially effective in relieving inattention and hyperactivity but not impulsivity. Bupropion's therapeutic effect derives from its ability to increase the concentrations of norepinephrine and dopamine in the synaptic cleft.[45] The principal dose-dependent toxic effect of bupropion is stimulation, which may lead to anxiety, agitation, and seizures. Other side effects from bupropion therapy include fatigue, dry mouth, insomnia, headache, nausea, vomiting, constipation, and skin rash.

When either a TCA or bupropion is prescribed for ADHD, it is often accompanied by clonidine or guanfacine — centrally acting α_2-adrenergic agonists used to control hypertension — which are specifically effective in controlling impulsivity and aggressivity.[46,47] These agents may be effective in ADHD because they alter the activity of norepinephrine in the locus ceruleus.[48] Systemic side effects include sedation, depression, and possibly hypotension.

Atomoxetine, an antidepressant medication that selectively raises the concentration of norepinephrine in the synaptic cleft, was approved in

Table 1

Drugs Commonly Used to Treat ADHD and Their Adverse Systemic Side Effects and Interactions With Dental Therapeutics

Drug (trade name)	Other common usage	Side effects and interactions
Amphetamine and dextroamphetamine (Adderall)	Narcolepsy	Do not use or prescribe meperidine; danger of hypotension and respiratory collapse. Use vasoconstrictors with caution, in low doses and with careful aspiration. May potentiate central nervous system stimulation caused by large doses of propoxyphene. Anorexia and reduced weight gain in children. Potentiates arrhythmogenic effects of tricyclic antidepressants.
Atomoxetine (Strattera)	None	Use associated with elevated blood pressure and pulse. Avoid levonordefrin; use epinephrine with caution, in low doses, and with careful aspiration. Propoxyphene increases the stimulant effect of atomoxetine.
Bupropion (Wellbutrin, Zyban)	Antidepressant, smoking cessation	May cause central nervous system stimulation, including agitation, anxiety, and seizures. Increased seizure activity when concurrently administered with tricyclic antidepressants.
Clonidine (Catapres)	Antihypertensive	Increases sedation of other central nervous system depressants. May cause cardiac arrhythmias and orthostatic hypotension.
Desipramine (Norpramin)	Antidepressant	Avoid levonordefrin; use epinephrine with caution, in low doses, and with careful aspiration. Increases sedation of other central nervous system depressants. May cause orthostatic hypotension. Causes antimuscarinic effects.
Dextroamphetamine (Dexedrine)	Narcolepsy	Do not prescribe meperidine; danger of hypotension and respiratory collapse. Use vasoconstrictors with caution, in low doses, and with careful aspiration. May potentiate central nervous system stimulation caused by large doses of propoxyphene. Anorexia and reduced weight gain in children. Potentiates arrhythmogenic effects of tricyclic antidepressants.
Guanfacine (Tenex)	Antihypertensive	Increases sedation of other central nervous system depressants. May cause orthostatic hypotension.
Imipramine (Tofranil)	Antidepressant	Avoid levonordefrin; use epinephrine with caution, in low doses, and with careful aspiration. Increases sedation of other central nervous system depressants. May cause cardiac arrhythmias and orthostatic hypotension. Causes antimuscarinic effects.
Methylphenidate (Ritalin, Concerta, Methylin, Metadate)	Central nervous system stimulant	May rarely cause thrombocytopenia, leukopenia, and anemia. Use vasoconstrictors with caution, in low doses, and with careful aspiration. Anorexia and reduced weight gain in children. Potentiates arrhythmogenic effects of tricyclic antidepressants.

November 2002 by the United States Food and Drug Administration for the treatment of ADHD in children. It appears to improve all three of the core symptoms of ADHD, namely inattention, hyperactivity, and impulsivity. Its use is associated with an increase in blood pressure and pulse, decreased appetite, weight loss, tiredness, fatigue, and sleep disturbance.[49,50]

Behavior therapy involves providing rewards (positive reinforcement) for demonstrating desired behaviors (e.g., improving relationships with parents and siblings, improving volume of completed school work) or consequences (negative reinforcement) for failure to meet the goals. Repetitive application of the rewards and consequences has been shown by a few investigators to promote positive behavior of children with ADHD.[51] To maximize the effectivness of behavior therapy, it is often combined with parental training and family therapy. Parents are taught how to give the child clear instructions, to positively reinforce good behavior, to ignore some behaviors, and to use punishment (such as "time-outs") effectively. Family therapy involves teaching the family how to negotiate and solve as a cohesive unit the problems of raising and managing the child.

Specialized education techniques are often required to assist children with ADHD, because more than one-third of them have a co-occurring learning disorder. These techniques include increased structure, predictable routine, learning aids, resource room time, and homework checked by parents and teachers.[52]

The parents of children with ADHD often (60 percent) turn to "complementary" (used in addition to traditional therapy) or "alternative" (used as a replacement for traditional therapy) medicine because they perceive it to be more "natural" and free of the stigma associated with stimulants and antidepressants. Practitioners of these arts often recommend additive-free diets and low- or no-sugar diets (e.g., Kaiser-Permanente diet, Feingold diet). They also recommend supplementing the diet with chamomile, kava kava, and valerian for their sedative effects, or gingko biloba and ginseng to improve learning, memory, and cognition. Megavitamin therapy (specifically iron, pyridoxine, zinc, and magnesium), guided imagery, biofeedback, and massage are also used by these complementary/alternative medicine practitioners to treat the disorder. These interventions are not supported by evidence-based studies.[53-55]

Table 2

Adverse Orofacial Reactions to Drugs Used to Treat ADHD

Drug (trade name)	Xerostomia	Sialorrhea	Dysphagia	Sialadenitis	Dysgeusia	Stomatitis
Amphetamine and dextroamphetamine (Adderall)	yes	no	no	no	yes	no
Atomoxetine (Strattera)	yes	no	no	no	no	no
Bupropion (Wellbutrin, Zyban)	yes	no	no	no	yes	yes
Clonidine (Catapres)	yes	no	yes	yes	no	no
Desipramine (Norpramin)	yes	no	no	yes	yes	no
Dextroamphetamine (Dexedrine)	yes	no	no	no	yes	no
Guanfacine (Tenex)	yes	no	no	no	yes	no
Imipramine (Tofranil)	yes	no	no	yes	yes	yes
Methylphenidate (Ritalin, Concerta, Methylin, Metadate)	yes	no	no	no	no	no

Orofacial Findings and Dental Management Implications

Minor physical anomalies of the orofacial region are the most frequently reported biological abnormality in ADHD. These anomalies are termed "minor" because they rarely present a cosmetic concern. Prevalence rates have not been determined, but hypertelorism (wide spacing of the eyes), highly arched palate and low-set ears are most commonly reported.[56]

Orofacial injury is also common because children with the disorder are constantly running and climbing, and occasionally falling.[57] However, injuries to children with ADHD are not always accidental. A hyperactive child is five to seven times more likely to suffer physical abuse from a parent than is a child

Gingivitis	Glossitis	Tongue edema	Discolored tongue	Bruxism	Miscellaneous
no	no	no	no	yes	Loss of smell and taste acuity
no	no	no	no	no	Angioneurotic edema, vomiting, ear infection, sinusitis, sinus headache
yes	yes	no	no	yes	Toothache, oral edema, dysphagia
no	no	no	no	no	Parotid gland swelling and pain
no	no	yes	yes	no	Facial edema
no	no	no	no	yes	Loss of smell and taste acuity
no	no	no	no	no	Rhinitis, tinnitus
no	no	yes	yes	no	Facial edema
no	no	no	no	no	Erythema multiforme

in the general population.[58-63] A good history obtained from the parent/caretaker and a separate informal one obtained from the child is vital for the correct diagnosis.

Provision of comprehensive dental care to children under treatment for ADHD usually requires only minimal modification because their behavior in the dental office often does not differ significantly from peers free of the disease. The standard "tell-show-do" technique is very effective for young children with ADHD. The technique instills trust, focuses the child's attention on the procedures, and stimulates cooperative behavior.[64] Dental appointments should be scheduled in the morning, when these children are least fatigued, most attentive, and best able to remain seated in the dental chair. Morning appointments are also appropriate because most medication regimens are designed for the maximum drug effect (enhanced cognition and behavior) to occur during the early part of the school day.

Compliance with an age-appropriate home care regimen is difficult for some of these children.[65] Understanding and adherence are enhanced when colorful or highly stimulating educational materials are employed, and instructions are simplified and repeated numerous times during the dental treatment visit.[66] Emphasis should be placed upon the brushing of teeth rather than the specifics of a brushing technique.[67] Compliance may be enhanced by having the parents reward (small amounts of money) the child each time he or she initiates and completes a tooth brushing episode.[68]

Many of the medications used to treat ADHD have adverse orofacial side effects (**Table 1**).[69,70] The stimulants methylphenidate, amphetamine, and dextroamphetamine may cause xerostomia; and use of the latter two medications is also associated, on occasion, with loss of smell and taste acuity. The antidepressants desipramine, imipramine, and bupropion may cause xerostomia and dysgeusia (altered taste sensation). The α_2-adrenergic agonists clonidine and guanfacine may cause xerostomia, with the former medication also being occasionally implicated in parotid gland swelling and pain. Atomoxetine has also been shown to cause xerostomia and sinusitis.

The medications used to treat ADHD also cause adverse interactions with drugs used in dentistry (**Table 2**).[71-74] As previously mentioned, methylphenidate, amphetamine, and dextroamphetamine are associated with elevations in systolic and diastolic blood pressure and a more rapid heart rate. Prudent care necessitates taking and recording the patient's preoperative vital signs and intraoperative values as deemed clinically necessary. Obtaining profound local anesthesia, and thus limiting pain and the endogenous production of catecholamines that might interact with these agents, is mandatory. Moreover, an aspirating syringe must be used to avoid intravascular injection and the possibility of summation of drug effects with the pressor agents (epinephrine, levonordefrin) used in local anesthesia. It is also prudent to administer no more than 1 µg/kg of epinephrine up to a maximum of 40 µg (as is found in two cartridges of 2

percent lidocaine with 1:100,000 epinephrine) initially. If vital signs remain stable, additional anesthetic may be administered. The stimulants amphetamine and dextroamphetamine adversely interact with meperidine and may cause hypotension and respiratory collapse. These same two stimulants may likewise interact with large doses of propoxyphene, producing excessive central nervous system stimulation and seizure activity.

The TCAs desipramine and imipramine block the uptake of adrenergic vasoconstrictors (i.e., levonordefrin and epinephrine) compounded with many local anesthetic agents. They also block muscarinic and α_1-adrenergic receptors, actions that can, respectively, increase the heart rate and relax the peripheral vasculature. Although no adverse reports have been published for children, prudence dictates that patients receiving either of these two TCAs should not be administered a local anesthetic agent containing levonordefrin because cardiac arrhythmias and a dramatic increase in systolic blood pressure may follow, especially after an accidental intravascular injection. Epinephrine more modestly interacts with TCAs so that it can be used in reduced doses (e.g., one-half cartridge of 1:100,000 epinephrine per 10 kg body weight per half hour up to an adult maximum of three cartridges per half hour) and with careful aspiration to avoid intravascular administration.[75] Because atomoxetine also blocks the reuptake of norepinephrine, this same restriction on vasoconstrictors used for the TCAs should be followed for it until more is known about the drug's potential for this interaction.

Patients receiving TCAs should not be prescribed Zyban, the brand name of bupropion promoted for smoking cessation, because in tandem these medications decrease the seizure threshold. Counseling and other nonpharmacologic approaches are best instituted in these highly vulnerable patients, who smoke cigarettes at a rate twice that of individuals free of ADHD.[77]

Other adverse drug interactions between TCAs and medications used in dentistry may also produce significant morbid reactions. Sedative-hypnotics, antianxiety drugs, and opioids may have their depressant effects potentiated by TCAs, and respiratory depression may ensue. The administration of drugs with anticholinergic properties, such as atropine or scopolamine, can cause an increase in intraocular pressure and worsen occult or known narrow-angle glaucoma. Lastly, care should be observed when prescribing acetaminophen because of its ability to increase TCA concentrations.[76]

Patients receiving a centrally acting antihypertensive agent (clonidine or guanfacine) should have their preoperative vital signs obtained and recorded because of the propensity of these agents to cause hypotension. Opioids should be avoided or prescribed in reduced dosage because they may interact with these agents and potentiate their sedative and hypotensive effects.

Final Comment

Dentists caring for patients with ADHD must exhibit compassion. They must not misconstrue inattention, motor restlessness, and an inability to complete home care tasks with simple noncompliance but rather as a component of a disease requiring special techniques to manage. In consultation with the physician or psychologist treating the patient's ADHD, the full range of dental procedures can be provided to these individuals. CDA

Notes / a. Pemoline, another stimulant, is rarely used, as it is less effective than alternative drugs and has caused fatal hepatic failure.

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The Pathophysiology, Medical Management, and Dental Implications of Autism

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ABSTRACT

Autism is a lifelong, severe, developmental disorder that appears initially in infancy and early childhood and impairs the acquisition of some of the most important skills in human life. The disease is characterized by impaired social interactions, verbal and nonverbal communication deficiencies, limited activities and interest, and repetitive behaviors. Often accompanying the disorder are behavioral disturbances, such as self-mutilation and aggression, psychiatric symptoms, and seizures, which necessitate the administration of multiple medications to help the affected individual participate effectively in the educational and rehabilitative process. Dentists caring for these people must be familiar with the manifestations of the disease and its associated features so that they can garner the maximum level of cooperation. They must also be familiar with the medications used to treat the associated features of the disorder because many of these pharmaceuticals cause untoward orofacial and systemic reactions and may precipitate adverse interactions with dental therapeutic agents.

Autism (also known as autistic disorder and classic autism) is a neurobehavioral and cognitive disorder characterized by impaired development of interpersonal and communication skills and limited interests and repetitive behaviors.[1,2] Interpersonal-skill weaknesses are evident during infancy, when there may be a failure to cuddle, make eye contact, raise arms in anticipation of being picked up, engage in imitation games, gesture (e.g., pointing to or showing objects to others, waving bye-bye), and respond to smiles or a parent's voice. Young children with this disorder do not participate in group play and seem to lack the ability to analyze social situations, such as recognizing the feelings and desires of others. Likewise, they fail to use facial expression and body language to interact with others. As teenagers and young adults, they remain

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usually oblivious to the presence and needs of others, are unable to empathize and see the world from other people's points of view, lack an interest in sharing their achievements with others, and prefer instead to engage in solitary activities rather than form friendships.

Verbal communication skills (i.e., acquiring language expression and comprehension) are delayed (the child fails to use single words by 16 months and two-word spontaneous phrases by 24 months) or are absent. Among those individuals who do speak (approximately 50 percent), however, there is often an inability to initiate or sustain conversation with others and an inability to integrate words with gestures, and the language used tends to be rote, repetitive, and lacking meaning. In addition, there is an inability to answer questions, an inappropriate use of personal pronouns (often saying "you" for "I"), a lack of understanding of directional verbs (give, take), and a lack of understanding that words can have multiple meanings. Phenomena such as echolalia (the involuntary repetition of what has just been heard), delayed echolalia (repetition of things heard in the past such as radio and television commercials), and abnormal patterns of speech volume, pitch, and rate are also often heard.[3]

Limited interests and activities are demonstrated by play that lacks creativity and imagination. Instead of building with blocks, children with autism may line them in rows, or they may become persistently occupied by the sensory features of objects such as buttons in an electrical appliance, buttons on a dress, or parts of the body. As they get older there may be an intense, inflexible focus on such rituals as memorizing and repeating dates, phone numbers, and radio station call letters. The establishment of rigid routines and fear of novelty are likewise expressed by the demand to wear the same clothes every day and to follow the same schedule. Repetitive body movements may also be present, including compulsive touching, hand clapping, finger licking, and rocking, swaying, and dipping of the body. Stress, excitement, or certain stimuli (noise, etc.) may trigger these repetitive actions.

Mental retardation is evident in approximately 70 percent of individuals with autism. Tasks requiring reasoning, interpretation, integration, or abstraction are uniquely difficult for these people to complete.[4] The majority of individuals with autism function in the "moderate" range of retardation. The severity of mental retardation is defined by a combination of the intensity of support needed by the individual to cope with common life demands, by how well they meet the standards of personal independence expected of them by age (level of adaptive functioning), and by the results of intelligence quotient tests (**Table 1**).

In recent years, it has become apparent that there are enormous variations in behavioral patterns and the severity of illness among individuals with autism.

Behavioral symptoms, particularly in young children, include temper tantrums and, as they get older, hyperactivity, short attention span, impulsivity, agitation, anger, aggressivity, and self-injurious behaviors (head banging, hand biting). Unusual responses to sensory stimuli (e.g., a high threshold for pain, oversensitivity to being touched, exaggerated reactions to light or odors) are also common, as are abnormalities in eating, such as limiting their diet to a few foods.

Various nonspecific neurological symptoms or signs may be noted (e.g., primitive reflexes, delayed development of hand dominance). Seizures (often grand mal) are also common, with more than 30 percent of adolescents having had two or more epileptic seizures. Likewise, psychiatric illnesses such as anxiety disorders, mood disorders, attention-deficit hyperactivity disorder, and obsessive-compulsive disorder become more prevalent during adolescence.[5]

The diagnosis of autism is based on the patient's developmental and medical history and on the identification of the aforementioned deficits. To assist the clinician, instruments such as the Autism Diagnostic Interview and the Autism Diagnostic Observation Schedule may be used. However, no specific genetic, medical, or laboratory tests are available to confirm the diagnosis.

In recent years, it has become apparent that there are enormous variations in behavioral patterns and the severity of illness among individuals with autism. This recognition has led to the development of a number of classification systems, some of which have overlapping diagnostic labels. Pervasive developmental disorder, sometimes referred to as autistic spectrum disorder, is an umbrella term used to describe this group of illnesses. Classic autism is the most severe of the three most common pervasive developmental disorders. Children with more social activity, higher empathy, and greater interaction are given a diagnosis of "pervasive developmental disorder, not otherwise specified" (or in some instances, a diagnosis of "atypical autism"). Children who possess relatively normal language

Table 1

Severity of Mental Retardation, Prevalence and Associated Degrees of Intellectual and Adaptive Function[1]

Severity of MR and corresponding IQ	Prevalence of severity among those with MR	Degree of intellectual function	Academic skill level	Degree of adaptive function
Mild IQ 50-70	85%	Develop social and communication skills during preschool years. Have minimal impairment in sensory motor areas.	Sixth grade	Can achieve social and vocational skills adequate for minimum self-support. Can live successfully in community either independently or in supervised setting.
Moderate IQ 35-49	10%	Acquire communication skills during early childhood years. Can attend to own personal care needs. Can master some vocational training.	Second grade	May have difficulties in recognizing social conventions, which can interfere with peer relationships. Can perform unskilled or semiskilled work with supervision. Can live in community in supervised setting.
Severe IQ 20-34	3%–4%	During early childhood are unable to acquire communicative speech. During school-age period may learn to talk. Can be trained in elementary self-care skills.	May learn alphabet and simple counting.	May be able to perform simple tasks in closely supervised setting. Can adapt well to life in community in group homes or with their families.
Profound IQ <20	1%–2%	Usually have diagnosed neurological condition causing mental retardation. During early childhood display considerable impairment in sensory motor functioning.	Motor development, self-care and communication skills may develop if appropriate training is provided in a highly structured environment with constant aid and supervision.	Require close supervision and sheltered setting.

skills and intelligence but who display poor social skills, decreased ability to show empathy, and who often have unusual interests that are pursued with great intensity are given a diagnosis of Asperger's disorder.[6,7]

Epidemiology

A major epidemiologic study conducted in California noted that between 1987 and 1994 the prevalence of autism increased from 5.8 to 14.9 per 10,000 live births. The authors of the study could not determine if the observed increase in autism was due to improvements in detection, changing and broadening of diagnostic criteria, or a true increase in prevalence.[8] In the California study and in other studies conducted around the world, race, social class, and level of parental education do not appear to affect the prevalence of the disorder.[9] Males affected by the autism, however, far outnumber females (by fourfold). When the disorder appears in a female, it is often associated with a more severe degree of mental retardation.[10] Two recent studies, conducted in New Jersey and Georgia, demonstrated that the prevalence of autism is even greater than that noted in California. In these latter studies, the prevalence of children having autism was determined to be 40 per 10,000; when autism and all of the other related disorders classified under the pervasive developmental disorder heading were combined, the rate was 67 per 10,000 individuals.[11,12] These figures translate to roughly 460,000 children younger than 18 years of age with pervasive developmental disorder in the United States.

Approximately 2 percent of individuals with autism live independently as

adults, and another 15 percent manage partial independence. This group of individuals, termed high-functioning, consists mainly of those with relatively high (>80) IQ scores. The remaining 80 percent to 85 percent of individuals are totally dependent on others throughout their lives. One follow-up study of autistic children at age 20 found 30 percent living with their families and the rest in group homes or institutions.

Etiology

The cause of autism is not known, although evidence from family and twin studies suggests that it is an inherited disorder involving multiple genes and chromosomal regions. The monozygotic (identical) twin of an individual with autism (with virtually 100 percent genetic commonality) has an approximately 60 percent chance of having autism, and a chance in excess of 90 percent if related pervasive developmental disorders are included. The dizygotic (fraternal) twin of an individual with autism (who shares 50 percent of the genes) has approximately the same risk as a sibling, about 5 percent. A member of the general population, however, has only a 0.2 percent chance of having autism.[13]

Families of people with autism also have an increased rate of social deficits, including aloofness, shyness, oversensitivity, impulsiveness, irritability, abnormal social discourse, and an increased incidence of mood and anxiety disorders. The clustering of these conditions in families with autistic people suggests the expression of an underlying predisposition to autism.[14]

Neuroimaging studies using magnetic resonance imaging and positron emission tomography have shown that some people with autism have abnormal function in brain areas (e.g., amygdala and hippocampus) responsible for emotional and social functions, recognizing faces, and deciphering the facial expressions of other individuals as to their thoughts, feelings, and intentions. Functional MRI demonstrates that these individuals also lack the ability to activate areas in the cerebellum necessary for sustained attention. These findings are consistent with autopsy studies that have shown well-defined anatomic abnormalities in the amygdala, hippocampus, and cerebellum.[15-18]

Numerous other etiologic theories have been advanced, including perinatal injury; inadequate parenting (a cold, distant mother); Crohn's disease, inflammatory bowel disorder; intestinal candidiasis; vaccines to immunize against measles, mumps and rubella (exposure to minuscule amounts of mercury preservative or the persistence of measles in the enteric lymphatic system); and food allergies. None of these theories has been substantiated.[19-22]

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Medical Treatment

Comprehensive management of the patient with autism includes parental counseling, special education (often with the emphasis on behavior modification) in a highly structured environment, speech therapy, and social skills training with the ultimate goal of achieving independence in activities of daily living and self-care. Behavior modification therapy initially involves identifying the social and communications skills that the child lacks. These skills are then broken down into simpler actions, taught separately, and, once mastered, integrated and sequenced. For example: Turn on water — take cap off toothpaste tube — wet brush — place paste on brush — rewet brush with water — brush teeth — turn off water — replace cap on tube. Use of attention, praise, smiles, and, initially, candy (preferably something noncariogenic) or little toys reinforces the child's learning process.

Early diagnosis followed by aggressive, appropriately targeted intervention before age 2 appears to improve outcome, especially in behavior and functional and communication skills.[23] Some children learn to feed and dress themselves and to conduct themselves in a socially acceptable fashion. Preliminary findings from ongoing studies also show positive outcomes in terms of IQ gains and reduction in symptom (rituals and self-destructive actions) severity.[24]

Medication is often used to ameliorate the behavioral symptoms that interfere with an individual's ability to participate in educational interventions. Specific target symptoms may be controlled to some extent by the use of particular pharmacotherapeutic agents, for example: hyperactivity — methylphenidate; repetitive behaviors — fluoxetine, sertraline, and pimozide; and aggressive behaviors — lithium, carbamazepine, valproate, risperidone, and olanzapine.[25-30]

The long-term effects of instituting these medications in young children remains unknown, and sadly these drugs have no effect on the inability to empathize and communicate.[31] Treatment with vitamin B-6 and magnesium salts, special diets (e.g., no gluten or casein),

steroids, electroconvulsive therapy, injected immunoglobulins, and the pancreatic enzyme secretin have not proved effective in controlled trials.[32]

Adverse Effects of Drug Therapy and Their Dental Implications

Many of the drugs used to treat the associated features of autism have systemic side effects (**Table 2**),[33-37] orofacial side effects, and adverse interactions with drugs used in dentistry (**Table 3**).[38,39]

Risperidone and olanzapine are classified as "atypical" antipsychotic medications and are often prescribed to manage symptoms of irritability, agitation, self-injurious behavior, aggressivity, repetitive behaviors, delusions, and hallucinations.[40] These antipsychotics may

- Induce motor disturbances affecting speech, swallowing, and the use of removable prostheses;
- Potentiate central nervous system depression caused by dental therapeutic agents; and
- Produce transient sialorrhea, followed in the case of olanzapine by xerostomia.

Orthostatic hypotension is a potential concern, especially in patients who are dehydrated, have cardiovascular disease, or are given other medications that lower blood pressure. On rare occasions, risperidone may cause thrombocytopenic purpura.

Pimozide, an antipsychotic agent that blocks dopamine receptors but whose exact mode of action has not been established, is prescribed to reduce repetitive movements and behaviors. Several macrolide antibiotics (e.g., clarithromycin and erythromycin) and azole antifungal agents (e.g., ketoconazole and itraconazole) should not be prescribed concurrently because the macrolides and azoles inhibit the cytochrome *P450 3A4* isoenzymes needed to metabolize pimozide, thereby permitting the emergence of serious and sometimes fatal cardiac arrhythmias. Pimozide therapy may result in xerostomia and is more likely than risperidone or olanzapine to elicit undesired motor disturbances.

Fluoxetine and sertraline, classified as selective serotonin reuptake inhibitors, are antidepressants often prescribed to manage symptoms of fear, anxiety, depression, self-mutilation, repetitive thoughts, and compulsive behaviors. Side effects include diarrhea, nausea, dizziness, sexual dysfunction, and occasionally an increase in bleeding time.[41,42] Fluoxetine and sertraline have also been shown to cause xerostomia (affecting approximately 18 percent of patients), dysgeusia (altered taste sensations), stomatitis, and glossitis. Adverse interactions between the inhibitors and some medications used in dentistry may occur because these antidepressants inhibit certain metabolic pathways. Specifically, these antidepressants inhibit the cytochrome *P450 2D6* isoenzymes needed to metabolize codeine to its active metabolite morphine. The ability of fluoxetine to inhibit cytochrome *P450 3A* isoenzymes causes it to potentiate the benzodiazepines alprazolam, triazolam, and midazolam. Conversely, erythromycin and clarithromycin may inhibit the metabolism of fluoxetine, leading to changes in mood or wakefulness. These dental therapeutic agents therefore should be used cautiously, and in reduced dosages.[43]

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Lithium, a mood stabilizer, and valproate and carbamazepine, anticonvulsants with mood stabilizing properties, are often prescribed to manage aggressivity, mood fluctuation, and seizures. Lithium may cause weight gain and hypothyroidism, which may lead to a diffuse, nontender, enlarged thyroid gland (goiter). Common side effects of lithium include nausea, diarrhea, drowsiness, acne, and fine hand tremor. Approximately 30 percent of patients also develop electrocardiographic changes. Most common are bradycardia and a benign, reversible, reduction in the amplitude of T waves. Altered renal function with lithium therapy may develop, as evidenced by polyuria and polydipsia persisting beyond initial therapy. Long-term use of valproate and carbamazepine is associated with approximately 9 percent of patients developing leukopenia, 7 percent developing thrombocytopenia, and a lesser number suffering a decrease in fibrinogen concentration.[44,45] Hepatotoxicity is a potential problem with valproate and may lead to irreversible hepatic failure.

Lithium has been shown to cause xerostomia, dysgeusia (a metallic taste), and oral ulcerations; and valproate and carbamazepine may cause xerostomia and glossitis.[46,47] A drug interaction of importance to dentistry is the potentiation of lithium toxicity by the co-administration of ibuprofen and some other nonsteroidal anti-inflammatory drugs. In the case of carbamazepine or valproate, aspirin and nonsteroidal anti-inflammatory drugs may cause excessive bleeding if either of these drugs has already impaired normal hemostatic mechanisms.

Table 2

Drugs Used to Treat Autism and Their Adverse Systemic Side Effects and Interactions with Dental Therapeutics[33-37]

Drug (trade name)	Common usage	Indications	Side effects and interactions
Carbamazepine (Tegretol)	Anticonvulsant	Mood stabilization Antiaggression Anticonvulsant	Long-term use associated with decreased white blood cell and platelet counts. Erythromycin, clarithromycin, and propoxyphene may inhibit the metabolism of carbamazepine and permit emergence of its side effects. Accelerates the metabolism of doxycycline.
Clonidine (Catapres)	Antihypertensive	Calm hyperactivity Reduce impulsivity	Increases sedation of other central nervous system depressants. May cause orthostatic hypotension.
Fluoxetine (Prozac)	Antidepressant	Reduce repetitive thoughts Reduce compulsive behaviors Antifear/antianxiety Treat depression Prevent self-mutilation	Side effects include diarrhea, nausea, somnolence, dizziness, and sexual dysfunction. Occasionally causes an increase in bleeding time. Increases sedation of other central nervous system depressants. May inhibit the metabolism of codeine, some benzodiazepines. Erythromycin and clarithromycin may inhibit metabolism of fluoxetine.
Lithium (Eskalith)	Antimanic	Antiaggression	Nonsteroidal antiinflammatory drugs and metronidazole may decrease renal clearance of lithium. Increases sedation when used concurrently with benzodiazepines. Nausea, diarrhea, drowsiness, acne, hand tremor are common side effects. May cause electrocardiogram changes, weight gain, and hypothroidism.
Methylphenidate (Ritalin)	Central nervous system stimulant	Calm hyperactivity Enhance attention	May rarely cause thrombocytopenia, leukopenia, and anemia. Anorexia and reduced weight gain in children with long-term use. Use vasoconstrictors with caution, in low doses, and with careful aspiration.
Naltrexone (ReVia)	Opioid antagonist	Reduce social withdrawal Prevent self-mutilation	May cause liver function abnormalities and hepatocellular injury. Induces opioid withdrawal syndrome in opioid-dependent individuals. Reverses effectiveness of narcotic analgesics; use nonsteroidal anti-inflammatory drug for pain relief.
Olanzapine (Zyprexa)	Antipsychotic	Rid delusions Rid hallucinations	Increases sedation of other central nervous system depressants. May cause antimuscarinic effects (e.g., constipation) and orthostatic hypotension. May induce motor disturbances (akathisias, etc.).
Pimozide (Orap)	Antipsychotic	Reduce repetitive movements and behaviors	Inhibited metabolism by clarithromycin, erythromycin, ketoconazole increases likelihood of severe cardiac arrhythmias. Increases sedation of other central nervous system depressants Commonly induces motor disturbances (akathsias, etc.).
Risperidone (Risperdal)	Antipsychotic	Antiaggression Reduce irritability/agitation Rid delusions Rid hallucinations	May rarely cause thrombocytopenia. Increases sedation of other central nervous system depressants. May cause orthostatic hypotension. May induce motor disturbances (akathisias, etc.).
Sertraline (Zoloft)	Antidepressant	Reduce repetitive thoughts Reduce compulsive behaviors Antifear/antianxiety Treat depression Prevent self-mutilitation	Side effects include diarrhea, nausea, somnolence, dizziness, and sexual dysfunction. Occasionally causes an increase in bleeding time. Increases sedation of other central nervous system depressants. May inhibit the metabolism (and analgesic effect) of codeine. Erythromycin and clarithromycin may inhibit metabolism of sertraline.
Valproate/ valproic acid (Depacon/ Depakene)	Anticonvulsant	Mood stabilization Antiaggression Anticonvulsant	May cause leukopenia, thrombocytopenia, and decreased fibrinogen concentration. May cause liver function abnormalities and irreversible hepatic failure. Erythromycin and aspirin may inhibit the metabolism of valproate. Aspirin and nonsteroidal anti-inflammatory drugs increase bleeding tendency.

Erythromycin and clarithromycin may cause carbamazepine toxicity by inhibiting its metabolism in the liver.

Naltrexone, an opioid antagonist, is prescribed to control symptoms of hyperactivity and restlessness. Its use has been associated with the development of dose-dependent hepatotoxicity. Opioid analgesics are ineffective when a patient is concurrently taking naltrexone; therefore, nonsteroidal analgesics should be prescribed for dental pain.

Clonidine, a centrally acting antihypertensive agent, is used to control symptoms of inattention, impulsivity, irritability, hyperactivity, and oppositional behavior in individuals with autism. The medication may cause orthostatic hypotension and potentiate the central nervous system depression of other nervous system depressants used in dentistry.

Methylphenidate tends to decrease hyperactivity and impulsivity and to improve attention span in patients with autism. As a central nervous system stimulant, the drug tends to promote anorexia and decreased weight gain in children along with insomnia and tachycardia. Long-term use may rarely cause thrombocytopenia, leukopenia, and anemia. A hypertensive episode may also occur if local anesthetics with vasoconstrictors are given in excess or by inadvertent intravascular injection.

Dental Treatment of Patients With Autism

Patients afflicted with autism will exhibit a wide variation in their level of understanding and ability to cooperate during dental treatment. A preliminary office visit to assess their capabilities, obtain a medical history, and gauge the extent of dental disease should be arranged. It is best to conduct the first two components of this analysis in the doctor's personal office rather than in the operatory, because the dental examination light and the noise of a dental engine (even if in another operatory) may be uniquely stressful for these individuals.[48]

The patient's medical history offers many valuable clues relative to successful dental management. Individuals with mild-to-moderate mental retardation and an absence of severe behavioral problems may be able to cooperate during treatment when using local anesthesia and, when necessary, nitrous oxide-oxygen sedation.[49] These patients, however, rarely fully cooperate in obtaining intraoral radiographs or in giving a meaningful response after anesthesia has been administered to the question, "Does your tooth, lip, or tongue feel funny?" The presence of parents/aides in the operatory is helpful and appears to comfort them and augments cooperation. Compliance is further enhanced by use of "tell-show-do" and by giving short, clear commands and positive and negative verbal reinforcement.[50,51] Use of a dental mouth prop to assist the patient in keeping the mouth open is helpful; however, use of hand over mouth and restraints such as a papoose board is controversial. The presence of bruises and abrasions about the head and face and traumatic ulcerations of the oral cavity should be noted in the patient's chart even though they are most often the result of patient self-abuse (picking or poking the mucosa with fingernails) rather than parental or caretaker abuse.[52,53] If surgical procedures are planned, patients taking medications that adversely influence the hemopoietic system (e.g., carbamazepine, methylphenidate, risperidone, valproate) may need a complete blood count, including platelets (**Table 2**). These data are often available from treating psychiatrists because they usually monitor hemopoietic status twice yearly.

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Patients with a history of moderate-to-profound mental retardation and behavioral problems severe enough to warrant psychiatric medication are usually unable to fully cooperate with care. The degree of sedation and respiratory depression provided by oral sedative medications is difficult to gauge and control even in normal patients and is best avoided in this vulnerable population. Administration of intravenous sedative agents in an office setting may be appropriate by an experienced clinician; however, clinicians have reported atypical responses and a need to abort some cases.[54] Long and involved treatment procedures are best performed in a surgical center or hospital setting under general anesthesia.[55] General anesthesia permits the dentist to perform a comprehensive, unhurried radiographic examination, as well as necessary preventive, restorative, and surgical treatments at one appointment.

Long-term care consists of increasing oral hygiene frequency and efficiency with the help of the parents and caregivers, daily application of topical fluoride gel or rinse, limiting cariogenic foodstuffs, and frequent preventive recall appointments.[56] A key component in this process is an assessment of the patient's ability to use a toothbrush, because some people with autism have been found to lack the necessary coordination to brush efficiently.[48] Parents or aides able to assist those having difficulty in brushing provide a meaningful service.

Table 3

Adverse Orofacial Reactions to Medications Used to Treat Autism[38,39]

Medication (trade name)	Xerostomia	Sialorrhea	Dysphagia	Sialadenitis	Dysgeusia	Stomatitis	Gingivitis	Glossitis	Tongue edema
Cabamazepine (Tegretol)	yes	no	no	no	no	yes	no	yes	no
Clonidine (Catapres)	yes	no	yes	yes	no	no	no	no	no
Fluoxetine (Prozac)	yes	no	no	yes	yes	yes	yes	yes	no
Lithium (Eskalith)	yes	no	no	yes	yes	yes	no	no	no
Methylphenidate (Ritalin)	yes	no	no	no	no	no	no	no	no
Naltrexone (ReVia)	yes	no	no	no	no	no	no	no	no
Olanzapine (Zyprexa)	yes	yes	yes	no	no	yes	yes	yes	yes
Pimozide (Orap)	yes	yes	no	no	yes	no	yes	no	no
Risperidone (Risperdal)	yes	yes	yes	no	yes	yes	yes	no	yes
Sertraline (Zoloft)	yes	no	yes	no	yes	yes	no	yes	yes
Valproate/valproic acid (Depacon/Depakene)	yes	no	no	no	yes	no	no	yes	no

*Tardive dyskinesia, rhythmic involuntary movements of tongue, face, mouth, jaw.

Final Comment

Dentists treating patients with autism must exhibit compassion as they provide care. They must also exhibit compassion for the family and caregivers when requesting their assistance in the preventive aspects of care. Our expectations as dentists must be tempered by the realization that the patient's preventive dental needs constitute only a small component of their total need. Families of people with autism are often exhausted by the need for constant supervision, feeding, toileting, diapering, bathing, and dressing and are often unable to fully comply with dental requests. CDA

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Discolored tongue	Bruxism	Miscellaneous
no	no	Erythema multiforme, carbohydrate craving
no	no	Parotid gland swelling and pain
yes	yes	Jaw pain, buccal-glossal syndrome
no	no	Carbohydrate craving
no	no	Erythema multiforme
no	no	Lymphadenopathy, sore throat, nasal congestion
no	no	Neck rigidity, facial edema, oral moniliasis, periodontal abscess
no	no	Tardive dyskinesia,* facial edema
yes	no	Toothache, tongue paralysis, sinusitis
no	yes	Gingival hyperplasis
no	no	Periodontal abscess, sinusitis, neck pain

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The Pathophysiology, Medical Management and Dental Implications of Fragile X, Rett, and Prader-Willi Syndromes

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ABSTRACT

Fragile X, Rett, and Prader-Willi syndromes are a group of inherited disorders that often present with varying degrees of mental retardation and challenging behaviors. Dentists caring for individuals with these disorders must be familiar with the manifestations of these diseases and their associated features so they can garner the maximum level of cooperation from the patient. They must also be familiar with the medications (anticonvulsants, antihypertensives, antidepressants, antipsychotics, and central nervous system stimulants) used to treat the associated behaviors, because many of these pharmaceuticals cause clinically evident orofacial and systemic reactions, and may precipitate adverse interactions with dental therapeutic agents.

Global developmental delay is used to describe children younger than 5 years of age who on clinical presentation appear to lag significantly behind their chronological peers in demonstrating gross and fine motor skills, speech and language abilities, cognition, social and personal skills, and the ability to perform activities of daily living. The term "mental retardation" is synonymous with global developmental delay but reserved for individuals old enough to have the diagnosis validated by intelligence quotient tests.[1] Mental retardation affects approximately 1 percent to 2 percent

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of the general population.[2] The severity of mental retardation is defined by a combination of the intensity of support needed by the individual to cope with common life demands, by how well the person meets the expected age-based standard of personal independence (level of adaptive functioning), and by the results of IQ tests (**Table 1**).[3,4] The prevalence of mild mental retardation is seven to 10 times greater than severe, but in half of all cases its etiology remains illusive. The causes of severe and profound mental retardation, however, can be identified in 60 percent to 70 percent of cases and in most instances are related to a genetic abnormality that alters brain development and function, giving rise to aberrant cognitive, behavioral, and physical features.[5,6] Down syndrome, a non-inherited chromosomal disorder, is the leading cause of mental retardation in the United States. The commonly encountered mental retardation disorders reviewed here include Fragile X, Rett, and Prader-Willi syndromes.

Fragile X Syndrome

Fragile X syndrome is the most common form of inherited mental retardation, with an estimated prevalence of 1 in 4,000 males and 1 in 8,000 females.[7] Currently, there are more than 50,000 people affected with the disorder in the United States.[8] Males are more severely affected than females. Males usually exhibit severe intellectual impairment, speech and language delay, parrot-like repetition of overheard words (echolalia), and social and behavioral difficulties, including problems with attention, hyperactivity, impulsivity, irritability, anxiety (shyness), and frequent tantrums. Also commonly noted are repetitive motor behaviors (preservation), enhanced sensitivity to visual, auditory or tactile stimuli (e.g., pulling away on being touched), elevated mouthing/smelling of objects, avoidance of eye contact, hand flapping, hand biting, and incontinence.

Females with fragile X syndrome are generally less cognitively impaired than males with the disorder and demonstrate a broader range of functional capabilities. Approximately 25 percent are found to be mentally retarded using standard IQ tests, 28 percent are borderline, and slightly more than half score in the low-normal range. Many of these high functioning females, however, still present with learning disabilities, such as the inability to plan and organize or shift attention from one concept to another (e.g., switching from sorting objects based on their shape to sorting them by color/executive function), problems with arithmetic and abstract reasoning, and difficulty in considering another person's perspective. Also commonly seen are deficits in social skills, such as avoiding eye contact, difficulty in initiating and maintaining conversation, shyness, depression, and aggressivity.[9,10]

> The difference in clinical outcome between boys and girls with fragile X syndrome occurs because males have an X and Y chromosome in each cell whereas females have two X chromosomes.

The difference in clinical outcome between boys and girls with fragile X syndrome occurs because males have an X and Y chromosome in each cell whereas females have two X chromosomes. In the male, when there is a mutation in the *FMR1* gene located on the X chromosome that is passed from mother to child, there is a genetic inability to produce fragile X mental retardation protein, which is required for the normal maturation of neurons and synapses in the brain. In the female, the production of the protein is maintained to varying degrees by the presence of the unaffected X chromosome, and therefore there is less impairment of brain development.[11,12]

In addition to the behavioral and intellectual deficits, the syndrome is also associated with physical defects that become more easily discernible after puberty. A long, narrow face, prominent ears, prominent forehead, prognathic mandible, and high-arched/narrow palate; hyperextensibility of finger joints; decrease in adult stature; and macro-orchidism. The underlying cause of these physical defects, and their relevance to deficits in fragile X retardation protein, still remains to be uncovered.[13]

The diagnosis of fragile X syndrome is made by clinical observation and developmental testing of the child's behavior, noting delays in reaching such developmental milestones as walking alone, sitting up, and speaking single words; it is confirmed by chromosomal analysis and fragile X DNA testing.[14] Prompt diagnosis enables children to receive early intervention services and families to receive genetic counseling. Although there are no proven remedies for fragile X syndrome, current efforts involve the input of many professionals, including psychologists, speech and language therapists, occupational and physical therapists, and special education teachers.

Table 1

Severity of Mental Retardation, Prevalence and Associated Degrees of Intellectual and Adaptive Function[1]

Severity of MR and corresponding IQ	Prevalence of severity among those with MR	Degree of intellectual function	Academic skill level	Degree of adaptive function
Mild IQ 50-70	85%	Develop social and communication skills during preschool years. Have minimal impairment in sensory motor areas.	Sixth grade	Can achieve social and vocational skills adequate for minimum self-support. Can live successfully in community either independently or in supervised setting.
Moderate IQ 35-49	10%	Acquire communication skills during early childhood years. Can attend to own personal care needs. Can master some vocational training.	Second grade	May have difficulties in recognizing social conventions, which can interfere with peer relationships. Can perform unskilled or semiskilled work with supervision. Can live in community in supervised setting.
Severe IQ 20-34	3%–4%	During early childhood are unable to acquire communicative speech. During school-age period may learn to talk. Can be trained in elementary self-care skills.	May learn alphabet and simple counting.	May be able to perform simple tasks in closely supervised setting. Can adapt well to life in community in group homes or with their families.
Profound IQ <20	1%–2%	Usually have diagnosed neurological condition causing mental retardation. During early childhood display considerable impairment in sensory motor functioning.	Motor development, self-care and communication skills may develop if appropriate training is provided in a highly structured environment with constant aid and supervision.	Require close supervision and sheltered setting.

Infants and toddlers with fragile X syndrome are provided early intervention programs that have language, social skills, and motor components. Sensory-integration occupational therapy using physical calming techniques decrease the incidence of tantrums and other behavioral problems in these children. School-age children are referred to a therapist who has experience with individuals having cognitive deficits or hyperactivity. These counselors use the person's existing capabilities, particularly their visual and imitation skills, to master such tasks as feeding, dressing, and toileting. Adolescents and young adults are afforded vocational training in the community where appropriate activities and behaviors are modeled by a mentor or teacher.

The challenging behaviors of individuals with fragile X syndrome often necessitate the administration of psychoactive medications.[15,16] Agents used to calm hyperactivity in preschool children include use of the antihypertensive drug clonidine, the central nervous system stimulant methylphenidate, and the anticonvulsant carbamazepine. In approximately 60 percent of school-aged children with fragile X syndrome, methylphenidate is used to enhance attention and concentration, and clonidine is used to prevent hyperarousal. Clonidine is also helpful for the sleep disturbances that are common in these children. In adolescence, mood lability often increases; and, for about 30 per-

Table 2

Adverse Orofacial Reactions to Drugs Used to Treat Mental Retardation[17,18]

Drug (trade name)	Xerostomia	Sialorrhea	Dysphagia	Sialadenitis	Dysgeusia	Stomatitis	Gingivitis	Glossitis	Tongue edema
Cabamazepine (Tegretol)	yes	no	no	no	no	yes	no	yes	no
Clonidine (Catapres)	yes	no	yes	yes	no	no	no	no	no
Fluoxetine (Prozac)	yes	no	no	yes	yes	yes	yes	yes	no
Lamotrigine (Lamictal)	yes	yes	no	no	yes	yes	yes	yes	yes
Lithium (Eskalith)	yes	no	no	yes	yes	yes	no	no	no
Methylphenidate (Ritalin)	yes	no	no	no	no	no	no	no	no
Risperidone (Risperdal)	yes	yes	yes	no	yes	yes	yes	no	yes
Sertraline (Zoloft)	yes	no	yes	no	yes	yes	no	yes	yes
Valproate/valproic acid (Depacon/Depakene)	yes	no	no	no	yes	no	no	yes	no

cent of the males, aggressive behavior is common. The aggression is often treated with antidepressants from the selective serotonin reuptake inhibitor family, such as fluoxetine or sertraline. Other medications used to treat aggression include carbamazepine, valproate, lithium, and risperidone.

Dental Considerations

Many of the medications used to treat fragile X syndrome have adverse orofacial side effects (**Table 2**),[17,18] systemic reactions, and interactions with medications used in dentistry (**Table 3**).[19-28] A number of medical problems are seen more often in people with fragile X syndrome than in the general population, and these are also germane to the practice of dentistry. Approximately 50 percent of adults and a lesser percentage of children have mitral valve prolapse.[29-31] When mitral valve prolapse is accompanied by a heart murmur, prophylactic antibiotics may need to be prescribed when performing invasive dental procedures.[32-34] Recurrent otitis media is common in young children and recurrent sinusitis in older individuals. Distinguishing pain associated with these entities from that of dental origin is difficult for these mentally challenged individuals. Also of concern is gastroesophageal reflux disease and recurrent emesis, which exposes the dentition to gastric acid and may result in the erosion of tooth structure. Generalized or complex partial seizures occur in about 20 percent of children with fragile X syndrome. The seizures are usually treated with carbamazepine, which is often discontinued in early adolescence when the seizures spontaneously disappear.

Rett Syndrome

Rett syndrome, first described in only 1966, is now recognized as the leading cause of profound mental retardation in girls and women, with a prevalence rate of 1:10,000 to 1:13,000.[35,36] (Males with the genetic defect underlying Rett syndrome typically do not survive past childbirth.) It is characterized by apparently normal development for the first six to 18 (and possibly 30) months of life. Thereafter, there is deceleration in the rate of cranial growth and an onset of extreme agitation accompanied by involuntary movements in all parts of the body, including the tongue. This episode is then followed by regression or loss of previously acquired cognitive and motor skills (e.g., reaching for objects, standing) over the ensuing days, weeks, and months.[37] Communication function is

Discolored tongue	Bruxism	Miscellaneous
no	no	Erythema multiforme, carbohydrate craving
no	no	Parotid gland swelling and pain
yes	yes	Jaw pain, buccal-glossal syndrome
no	no	Halitosis, gingival hyperplasia
no	no	Carbohydrate craving
no	no	Erythema multiforme
yes	no	Toothache, tongue paralysis, sinusitis
no	yes	Gingival hyperplasia
no	no	Periodontal abscess, sinusitis, neck pain

lost (i.e., loss of the ability to speak and understand single words/ phrases or nuanced babble that was initially learned), social skills (e.g., smiling) regress, eye contact is lost, and profound irritability develops.[38] Previously learned fine motor skills (e.g., passing toys from hand to hand) are replaced by repeated hand washing movements, interspersed with biting or rubbing the dorsum of the hand against the teeth and lips, and digit-hand sucking or licking.[39] Growth failure (especially noticeable are the small head and small, cold, blue-colored feet) is pervasive, with height and weight declining from near normal values at age 1 to below the fifth percentile for the normal population by age 7.[40] Approximately 25 percent of people with Rett syndrome never walk (secondary to spinal cord involvement) and are confined to a wheelchair, eventually developing muscle wasting and skeletal deformities (i.e., scoliosis). Tests indicate a mental age at the 8- to 10-month level and motor function at the 12- to 18-month level. Adaptive skills such as feeding, dressing, and toileting are never effectively acquired.

The girls who develop and retain the ability to walk do so in an aimless fashion, with the first step often being backwards (retropulsion). For these girls, communication functions such as socialization and eye contact may improve. In fact, intense staring to obtain eye communication or express wishes is a prominent feature of Rett syndrome. Well-functioning Rett syndrome females even tend to develop a surprisingly effective "eye pointing" language as a substitute for their loss of speech and fine motor communication skills. However, they remain incapable of self care; over the next several decades, they slowly lose motor function such that ambulation and stereotypic hand movements diminish in speed and frequency. Survival to middle age is typical, with 70 percent of women living to age 35 and some living to older than 60. Death is usually sudden and unexpected and presumed to arise from breathing dysfunction or cardiac arrhythmias.

The diagnosis of Rett syndrome is made by medical history and neurologic examination and is confirmed by a blood test that identifies a mutation in the *MECP2* gene. Recurrence within families is less than 1 percent; thus, Rett syndrome usually represents a new mutation. The mutated gene prevents adequate production of a protein normally found in the nucleus of many types of neurons. Loss of the protein results in arrested neuronal development, smaller neurons, a reduction in length and complexity of dendrites, impaired neuronal signaling, reduced brain weight, and reduced volume of the frontal cortex.[41-43]

Dental Considerations

Many of the medications used to treat Rett syndrome cause orofacial and systemic side effects (**Table 2**), and evoke interactions with medications used in dentistry (**Table 3**). A number of orofacial and medical problems are seen more often in people with Rett syndrome than in the general population that are germane to the practice of dentistry. Severe bruxism, occurring more often while the patient is awake then during sleep and producing loud grating sounds, causes severe attrition of the primary teeth. Very common during early childhood, the bruxism is resistant to dental fabrication of biteplanes and medical management (administration of benzodiazepines or muscle relaxants).[44-47] Accompanying the movement of the mandible are uncoordinated and repetitive movements of the tongue (often protrusion), bilateral masseter muscle hypertrophy, sialorrhea and drooling.[48,49] Inadequate nutrition is often a problem because of involuntary movements of the tongue and mandible, movement of food around the mouth, poor mouth closure (secondary to an anterior open bite resulting from continuous tongue protrusion), aberrant swallowing pattern, and a lack of hand use. Gastroesophageal reflux is also common, with the potential for erosion of tooth structure on exposure to gastric acids.

Irregular breathing during wakefulness (especially when under emotional or physical stress) and consisting of hyperventilation or breath holding is common between the ages of 5 and 10 years. Breath holding may be prolonged and alarming, occasionally exceeding one minute. In older people, it becomes common for each expiration to be achieved only after a Valsalva maneuver (expiration against a closed upper airway, with severe alteration in heart rate and blood pressure due to

Table 3

Drugs Used to Treat Mental Retardation and Their Adverse Systemic Side Effects and Interactions with Dental Therapeutics[19-28]

Drug (trade name)	Common usage	Illness	Indications	Side effects and interactions
Carbamazepine (Tegretol)	Anticonvulsant	Fragile X syndrome Rett syndrome Prader-Willi syndrome	Mood stabilization Antiaggression Anticonvulsant	Long-term use associated with decreased white blood cell and platelet counts. Erythromycin, clarithromycin, and propoxphene may inhibit the metabolism of carbamazepine and permit emergence of its side effects. Accelerates the metabolism of doxycycline.
Clonidine (Catapres)	Antihypertensive	Fragile X syndrome	Calm hperactivity Regulate sleep	Increases sedation of other central nervous system depressants. May cause orthostatic hypotension.
Fluoxetine (Prozac)	Antidepressant	Fragile X syndrome Prader-Willi syndrome	Antiaggression Antianxiety Treat depression Prevent self-mutilation	Side effects include diarrhea, nausea, somnolence, dizziness, and sexual dysfunction. Occasionally causes an increase in bleeding time. Increases sedation of other central nervous system depressants. May inhibit the metabolism of codeine, some benzodiazepines. Erythromycin and clarithromycin may inhibit metabolism of fluoxetine.
Lamotrigine (Lamictal)	Anticonvulsant	Fragile X syndrome Rett syndrome	Anticonvulsant	May rarely cause thrombocytopenia, leukopenia, or leukocytosis. May cause skin disorders, including rash, Steven-Johnson syndrome, and angioedema. Increases sedation of other central nervous system depressants. Decreased effect with chronic, high-dose acetaminophen.
Lithium (Eskalith)	Antimanic	Fragile X syndrome	Antiaggression	Nonsteroidal anti-inflammatory drugs and metronidazole may decrease renal clearance of lithium. Increases sedation when used concurrently with benzodiazepines. Nausea, diarrhea, drowsiness, acne, hand tremor are common side effects. May cause electrocardiogram changes, weight gain, and hypothroidism.
Methylphenidate (Ritalin)	Central nervous system stimulant	Fragile X syndrome Prader-Willi syndrome	Calm hyperactivity Enhance attention	May rarely cause thrombocytopenia, leukopenia, and anemia. Anorexia and reduced weight gain in children with long-term use. Use vasoconstrictors with caution, in low doses, and with careful aspiration.
Risperidone (Risperdal)	Antipsychotic	Fragile X syndrome Rett syndrome Prader-Willi syndrome	Antiaggression Antiagitation Rid delusions Rid hallucinations	May rarely cause thrombocytopenia. Increases sedation of other central nervous system depressions. May cause orthostatic hypotension. May induce motor disturbances (akathisias, etc.).
Sertraline (Zoloft)	Antidepressant	Fragile X syndrome Prader-Willi syndrome	Antiaggression Antianxiety Treat depression Prevent self-	Side effects include diarrhea, nausea, somnolence, dizziness, and sexual dysfunction. Occasionally causes an increase in bleeding time. Increases sedation depression of other central nervous mutilitation system depressants. May inhibit the metabolism (and analgesic effect) of codeine. Erythromycin and clarithromycin may inhibit metabolism of sertraline.
Valproate/ valproic acid (Depacon/ Depakene)	Anticonvulsant	Fragile X syndrome Rett syndrome Prader-Willi syndrome	Mood stabilization Antiaggression Anticonvulsant	May cause leukopenia, thrombocytopenia, and decreased fibrinogen concentration. May cause liver function abnormalities and irreversible hepatic failure. Erythromycin and aspirin may inhibit the metabolism of valproate. Aspirin and nonsteroidal anti-inflammatory drugs increase bleeding tendency.

the pressure generated in the chest). This may lead to ejection of saliva, which may be mistaken for "spitting." Among the most severely hypotonic people, inadequate, shallow breathing has been identified, which allows oxygen tensions to fall and carbon dioxide tension to rise.[50] Breath holding has also been reported during induction with 65 percent nitrous oxide and 35 percent oxygen for dentistry. Excessive somnolence after administration of oral midazolam or after emergence from general anesthesia has also been reported.[51-53]

Self-abusive behavior, such as hitting the mouth and face, hair pulling, and biting of fingers or hands, is seen on occasion, especially when the patient is agitated. It must not be confused with parental or caretaker abuse. Individuals with Rett syndrome appear to have little or no control over these behaviors, and attempts to stop them by behavioral methods are ineffective. Aggressive behavior directed toward others may also be a problem and is often controlled with risperidone.[54] Some girls with Rett syndrome, mainly in their teens and older, periodically have attacks of violent screaming, which may last for hours. These screams are often attributed to body pains (including those in the oral cavity) by care givers. However, even after thorough clinical examination, somatic abnormalities are rarely identified.[55] Seizures often develop (in 60 percent to 90 percent of Rett syndrome patients) and are successfully controlled with carbamazepine, valproate, or lamotrigine.

Prader-Willi Syndrome

Prader-Willi syndrome is a genetic disorder caused by deletion of the paternal genetic information on chromosome 15 coding for proteins required for general brain development, with particular emphasis on several regions in the hypothalamus. The disorder arises equally in both sexes, with an estimated prevalence of 1:10,000 births.[56] In utero, the fetus demonstrates decreased activity, and at birth the neonate has a weak cry, is unable to control movements ("floppy") of the head and neck (muscular hypotonia), has a poor suckling response, and may fail to thrive unless a feeding tube is placed. During this first year of life, the infant is friendly, easygoing, and affectionate. Toward the end of the first year of life, however, muscle tone and movements improve and developmental milestones (speech and motor skills) are achieved, although delayed. By 1 to 2 years of age, the child develops a voracious appetite (hyperphagia) and unless provided with food has a temper tantrum that often includes aggressive behavior and screaming.[57-60] The severe overeating is thought to be due to a failure of the normal satiety response following food intake.[61] Signs of mild-to-moderate mental retardation, physical inactivity, decreased pain sensitivity, disturbed temperature perception, and speech difficulties begin to manifest. As these children get older, they begin to hoard and steal food, severely and persistently overeat, exhibit mood swings, become socially withdrawn, make poor eye contact, and display self-abusive behaviors such as continually picking at their skin and biting their nails. These individuals also often exhibit compulsive and obsessional behaviors (e.g., adherence to rituals, insistence on certain routines, ordering and arranging), repetitive speech, repetitive questioning, stubbornness, impulsivity, and argumentativeness (e.g., strong resistance to certain rules).

> Irregular breathing during wakefulness (especially when under emotional or physical stress) and consisting of hyperventilation or breath holding is common between the ages of 5 and 10 years.

By adolescence, most people with Prader-Willi syndrome are severely obese (often with a body mass index that exceeds 33, where the normal for a male is 23 to 25 and for a female 20 to 22), of short stature (with small hands and feet), and with delayed sexual development (males: scrotal hypoplasia, undescended testes, small penis; females: hypoplasia of labia minora and/or clitoris; both sexes: decreased body hair, lack of voice change) because of inadequate function of the hypothalamus and its affects on the pituitary gland (i.e., lack of growth hormone).[62] Characteristic orofacial features present since birth now become more readily apparent and include fair hair and skin, narrow face, almond-shaped palpebral fissures, strabismus, and a narrow nasal bridge. They also often have a small, retruded mandible, a small mouth with downturned corners that are crusted with thick, ropey saliva, and a thin upper lip. On intraoral exam, the oropharynx may be small and crowded with hypertrophied tonsils.[61]

During adolescence, violent and aggressive behavior becomes more

overt, as does stealing money to obtain food and lying about it. By the early 20s, between one-third and one-half of individuals with Prader-Willi syndrome develop definable psychiatric problems.[64] Major depressive disorder requiring administration of selective serotonin reuptake inhibitor antidepressants, bipolar affective disorder requiring treatment with carbamazepine, and episodes of agitation with delusions and auditory hallucinations necessitating administration of risperidone have been frequently reported.[65-67] Physical problems also develop during adolescence, most of which are secondary to obesity, including scoliosis, diabetes mellitus, hypercholesterolemia, hypertension, obstructive sleep apnea (with loud snoring and daytime sleepiness), restrictive lung disease, and osteoporosis.[68] Death is likely to occur in the third and fourth decades from cardiovascular and respiratory disease.

Dental Considerations

Many of the medications used to treat Prader-Willi syndrome elicit adverse orofacial side effects (**Table 2**), systemic reactions, and drug interactions involving dental agents (**Table 3**). A number of orofacial and medical problems of interest to dentistry are also seen more often in people with Prader-Willi syndrome than in the general population.

Rampant dental decay has been frequently reported and arises from a combination of a preference for high carbohydrate food, poor oral hygiene, and reduced salivary flow.[69-71] Salivary flow in these individuals is only 20 percent of normal, and the decrease in salivary water contributes to the ropey, thick consistency.[72] The aberrant saliva incapable of remineralizing enamel has recently been implicated in fomenting the excessive tooth wear noted in many of these individuals.[73] Other dental abnormalities reported to occur in association with Prader-Willi syndrome include delayed tooth eruption, the presence of supernumerary teeth, and periodontal disease.[74]

During adolescence, violent and aggressive behavior becomes more overt, as does stealing money to obtain food and lying about it.

Dental Treatment

Patients afflicted with the disorders described in this paper will exhibit a wide variation in their level of understanding and ability to cooperate. A preliminary office visit to assess their capabilities, obtain a medical history, and gauge the extent of dental disease should be arranged. Patients taking medications that adversely influence the hemopoietic system (e.g., carbamazepine, lamotrigine, methyl-phenidate, risperidone, valproate) will need a complete blood count to assess platelet status if surgical procedures are planned (**Table 2**). Patients with fragile X syndrome have a high prevalence of mitral valve prolapse, a subset of which has an accompanying murmur requiring prophylactic antibiotics to decrease the risk of endocarditis when invasive procedures are performed. Evaluation of these patients by a cardiologist is prudent.

Patients able to cooperate with care can have standard dental procedures performed using local anesthesia. Use of a dental mouth prop to assist patients in keeping the mouth open is very appropriate given their poor muscular control. Physical restraints, however, should be avoided, because they further agitate the child. Long-term care should consist of increasing oral hygiene frequency with the help of the parents and caregivers, daily application of topical fluoride gel or rinse, and frequent preventive recall appointments.

Management of the uncooperative patient is more complex. The degree of sedation and respiratory depression provided by oral sedative medications is difficult to control in healthy patients and is best avoided in this vulnerable population. Administration of intravenous sedative agents for short procedures in an office setting may be appropriate when the clinician is proficient in gaining venous access in obese individuals and emergently intubating patients whose airway may be altered because of obesity, scoliosis, small stature, and hypertrophic tonsils.[75,76] Long and involved treatment procedures, however, are best performed in a surgical center or hospital setting.

Final Comment

Dentists treating patients with mental retardation must exhibit compassion as they provide care for the patient. They must also exhibit compassion for the family and caregivers when requesting their assistance in the preventive aspects of care. Expectations of the dental team must be tempered by the realization that the patient's preventive dental needs represent only a small component of their total need. Families of people with severe or profound mental retar-

dation are often occupied 24 hours each day, seven days a week, with feeding, toileting, diapering, bathing, and dressing.[77] CDA

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Approaching the Pediatric Dental Patient: A Review of Nonpharmacologic Behavior Management Strategies

Clarice S. Law, DMD, MS, and Stephen Blain, DDS, MS

ABSTRACT

One of the difficulties of the practice of dentistry is being responsible for the highest quality of care for patients while often having to propose alternate solutions for a variety of reasons, which include financial concerns. Dental practitioners treating young children have the added responsibility of gaining their patient's cooperation to render the best treatment. Determinants that influence the development of a behavioral strategy for a young patient include disease status, the child's physical and mental development, parental characteristics, and provider personality and capabilities. Classic strategies – including a supportive office environment, "tell-show-do," successive approximation, distraction, behavior shaping, and retraining – must be matched to the characteristics of each child and family situation. Current cultural trends suggest that disciplinary forms of behavior management strategies – such as hand-over-mouth, physical restraint, and even voice control – are losing societal acceptance.

For the typical dentist, the greatest challenge posed by the young dental patient requiring operative care is the need to elicit the child's cooperation. A practitioner of any level of experience must consider not only the nature and severity of dental disease, but also the interactions between the child, his or her parents, and him- or herself as the clinician. Optimal management of the young patient involves an entirely new set of skills that, given an understanding of some foundational principles, is easy to obtain and develop in both the new and seasoned clinician. The purpose of this review is to summarize some determinants that influence assessment of the pediatric dental patient as well as some classic strategies for managing the child in the dental setting. The article will also address assessment of the child and parents in the current cultural milieu and suggest some directions in behavior management strategies for the future. Ultimately, the goal of this review is to suggest some strategies that will allow the practitioner to give the best possible dental care to young children.

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Determinants of Care

Disease Status

The first thing to consider when deciding how to treat the child patient is disease status. This determines the necessity for treatment. The clinician must consider whether the proposed treatment is preventive or restorative since preventive measures such as dental prophylaxis, fluoride treatment, and sealants can often be deferred. In a child with caries, whether the lesions are incipient or active must also be considered. Again, treatment may sometimes be deferred in a child with incipient lesions. Making certain the parents understand the situation and the proposed solution is important here, particularly if a decision is made to wait until the next periodic evaluation to assess improvements in behavioral maturity and subsequent readiness for restorative treatment.

Extent of dental disease is another consideration. Involvement of multiple teeth creates more urgency than involvement of a single tooth, unless irreversible processes have been initiated. Pulpal involvement or infections make treatment more imperative. Although the primary dentition should certainly not be considered disposable, whether the tooth is deciduous or permanent may also influence the necessity of treatment. In addition, general health status is an important consideration. If the patient is medically compromised or has some other disability, the impact of dental disease changes. Dental and overall disease/health status is then weighed along with the other three determinants to establish an approach for treatment.

Developmental

A second area of consideration is the child's developmental status. As children develop from infancy to adolescence, their cooperative abilities likewise change. Along with knowing the age of a child patient, the dentist must assess his or her physical development, level of socialization, ability to function independently, intellectual development, and linguistic ability. All of these factors give an indication of the behavioral maturity of the child. **Table 1** summarizes some expected developmental stages for children at various ages.[1,2]

> Along with knowing the age of a child patient, the dentist must assess his or her physical development, level of socialization, ability to function independently, intellectual development, and linguistic ability.

Behavior has classically been separated into three stages: precooperative, uncooperative, and cooperative.[1] The precooperative stage extends from infancy to age 2 or 3 in a healthy child. This stage is characterized by an actual lack of cooperative ability. Communication skills and comprehension have not developed to a point where the child is capable of participating in treatment. Children with mental deficits and developmental delays can remain in this category indefinitely. When an infant or toddler presents for treatment, he or she can generally be assumed to be precooperative unless assessment proves otherwise.[3] Factors indicating that a child is moving into the cooperative stage can be identified through observation of the child even before initiating any dental procedures. Levels of socialization and linguistic abilities can be assessed by gauging the child's response when brought into the treatment area or while obtaining or updating the medical and dental history with the parents. Children who have moved out of the precooperative category are capable of carrying on conversations and following directions.[4,5]

Once a child has progressed beyond the precooperative stage, he or she can classically be categorized as either cooperative or uncooperative. A cooperative child is easy to recognize. This child responds well to questions, has no outward signs of apprehension or reluctance, and will follow directions with little hesitation and occasional enthusiasm. The uncooperative child can be more positively labeled as being "potentially cooperative." Developmental milestones indicate that this child should be able to cooperate, although he or she may not do so. Factors that affect a child's potential to cooperate may be internal or external.

Internally, cooperative ability may be modified by degree of fear/ease, degree of willfulness/willingness, and awareness of dental problems. For nearly all uncooperative children, the central issue in behavior boils down to fear and/or willfulness. These characteristics can occur either as a function of an individual's innate personality/temperament or as a result of some previous experience.[6-9] Distinguishing between these two potential origins is rather important, as it will affect behavioral strategies. Fearfulness is much easier to deal with. If the child is afraid of the unknown, the dentist can focus on making things known. If the child is afraid because of a previous violation

Table 1

Developmental stages for children and adolescents

Sensorimotor period

Age 0 to 2 years

- Unable to reason
- Reality is external
- No object permanence
- Reacts to stress with senses
- Element of amnesia

Preoperative period

Age 2 years

- Geared to gross motor skills
- Likes to see and touch
- Very attached to parent
- Solitary play; rarely shares
- Limited vocabulary; early sentence formation
- Becoming interested in self-help skills

Age 3 years

- Less egocentric; likes to please
- Very active imagination; likes stories
- Remains closely attached to parent

Age 5 years

- A period of consolidation; deliberate
- Takes pride in possessions
- Plays cooperatively with peers
- Relinquishing comfort objects

Concrete operations

Age 6 to 13 years

- Eager to learn
- Discriminates, classifies
- Cause-and-effect logic
- Begins to trust
- Internal organization (conceptualization)
- Recognizes and understands pain

Formal operations

Age 13 to 17 years

- Can deal with abstract
- Can solve complex problems
- Reasons inductively
- Developing ideals and attitudes

Based on McDonald and Avery,[1] and Barber and Luke.[2]

of trust, the clinician can work toward the establishment of trust. Willfulness is more difficult, because it may require a breaking or redirecting of the will and the establishment of authority. Fear and willfulness as core issues are not mutually exclusive. They may interact and can potentially be modified according to the child's understanding of his or her dental problems. Thus, patient education is paramount for the potentially cooperative child, particularly if the origin of the fearful or willful behavior is a previous experience. Fear or willfulness that is simply part of the child's personality or temperament is harder to address. This must also be considered.

Externally, cooperative ability may be modified by previous medical experiences. The child who has experienced multiple unpleasant medical interventions tends to be far less amenable to dental procedures than the child who has had only pleasant experiences.[8,10] Parental response also plays an external role in the modification of cooperative ability. Parents who are fearful often project this anxiety onto their children.[8,11] The unique family dynamics of each child also affects the response to authority figures and willingness to submit to authority.[9,12]

Overall, developmental determinants are highly variable. Not all 3-year-olds respond the same way, nor do all 8-year-olds respond the same. Personality and temperament play an important role in cooperation that cannot fully be related to chronological age.

Parental

A third area of consideration in the development of a strategy to approach the child patient is interaction with the parents. A general understanding of various cultures is important when considering the effect of parents on the behavior of the child. Culture can affect diet and feeding habits. Sugar content of traditional foods can vary. Other practices, such as the lemon-sucking common in some Middle Eastern and Latin countries, may have deleterious effects on

oral health. As for feeding habits, some cultures encourage prolonged breastfeeding or feeding at night. Mealtimes also vary, with some countries taking meals right before bedtime or a prolonged siesta naptime. Oral hygiene practices and the value placed on dental care also differ according to culture. Even in highly developed countries there is the thought that "they're just baby teeth and are going to fall out anyway." Developing countries tend to value oral health to an even lesser extent. Finally, the cultural background of the parents affects child-rearing philosophies and value for authority, which affect the influence the dentist can have on a child. The practitioner must be culturally sensitive and committed to exploring the impact of culture on the child and family.

The socioeconomic status of the parents also bears some weight.[1] Children in privileged school systems tend to have better oral hygiene practices. Somewhat paradoxically, children from higher socioeconomic groups have more restorations, which tend to be less extensive than those of lower groups, in which extractions are more common. This finding mainly reflects differences in access to dental care. Unfortunately, an increase in negative behaviors is associated with more invasive procedures and multiple appointments, both of which are affected by access to care.[13] Finally, socioeconomic status may affect access to behavior management strategies. Treatment under general anesthesia or deep sedation is often financially prohibitive. This factor often makes nonpharmacologic treatment a necessity.

The most important parental determinant is personality. An accurate assessment of the personality of the parent can significantly influence treatment approaches. The following is a summary of some parental personalities.[1,14] There is the appropriate attitude. This parent is nurturing and protective, yet comfortably transfers authority to the dentist. The dentist is allowed to communicate directly with the child, while the parent facilitates, rather than detracts, from the communication and bonding process. The compensatory type is marked by the attempt to be supermom or superdad. These parents have the best intentions, pursuing the right thing for their children, but ask many questions and a have high need for approval of their parenting. These parents should be approached with affirmation of what they are doing for their children and given assurance that they need not live in guilt over the presence of dental disease. The overprotective parent often emerges out of the context of a maladjusted family, with little warmth. Alternatively, they may have experienced childbirth late in life or a threatening event to the child's health or life. These parents are often dependent on the child's dependency. These parents should be approached with a gentle discussion of the child's actual behavioral ability and the need for the development of independence. Again, the development of trust is important. Manipulative parents are demanding, with underlying issues of control and power. These parents often attempt to direct the course of treatment. With these parents, strict adherence to the stated office policy is important. Rational conversation may also help in revealing the underlying causes for their behavior. Also important is helping the parent understand that an adversarial relationship with the dentist does not promote the best interests of the child. The hostile parent may have had a previous poor experience or harbor generally negative attitudes toward health professionals. They may feel insecure in a foreign environment or may simply have misconceptions about dentistry. Hallmarks of this attitude are noncompliant behavior, failure to make eye contact, or a constant questioning of the need for treatment. Often, a compassionate, open conversation can smooth the relationship. Another personality type is the neglectful parent. This attitude is generally related to parental values and lifestyle. These parents may be overly busy, careless, or unappreciative of good dental care. These parents must be educated about the importance of dental health. They must also be made aware of the impact of their attitudes on the well-being of their children. There is another emerging attitude, which hasn't been addressed in the literature, but can be labeled the overindulgent type. These are the parents who are somewhat informed about pop psychology and state concerns about damaging the self-esteem of their children. These parents place few limits and allow their children to make significant choices. They are quite difficult to partner with in the management of their children because they are often convinced that their "yes" is more in the child's best interests than the dentist's "no."

Comprehending the cultural, socioeconomic, and personality determinants of the parents can help us understand the context for the child's behavior.

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ior. This again can set the tone for a behavior management strategy.

Provider

The behavior of a dentist can strongly affect his or her relationship with the child patient, in turn affecting the behavior of the child.[3,15-17] Therefore, an understanding of provider determinants is important when planning behavior management strategies. The personality of the provider is one such determinant. Some people innately feel more comfortable with an authoritative style, while others may be more naturally inclined to a more empathic approach to the child. Other personalities may be more naturally suited to a personal, high-touch approach. The literature outlines four dentist-related behavioral dimensions that predict success in managing children.[15] In the guidance dimension, dentists who give clear directions and reinforcement achieve the least fear-related behaviors. On the contrary, negative guidance — such as coercion, coaxing, or putdowns — is not as successful. The empathy dimension is another area of behavior influenced by provider personality. Questioning the child for feeling during difficult procedures tends to have a positive effect, as does reassurance. The physical contact dimension indicates the frequency of the dentist's contact with the child. Positive contact — patting or stroking — has a positive effect. Finally, in the verbalization dimension, results indicate that constant conversation is not always beneficial. Mixing up the targets of verbal communication (i.e., to the assistant, parent, and child) may prevent the child from being inundated with auditory input. Each practitioner must therefore consider his or her own personality and adjust accordingly.

As with parental determinants, culture plays a role, affecting communication style and views on authority, male-female interactions, and misbehavior. These elements must be considered in the context of the office environment and the relationship with both parent and child. Manifestations of certain personality characteristics or some preferred behavioral strategies may not be acceptable in all circumstances.

Providers must be aware of the limitations of their personalities and cultural backgrounds.

Experience and educational background also play roles in the development of behavior management strategies.[18] Dentists who have had minimal exposure to children younger than 3 years of age tend not to feel comfortable treating these young patients. In fact, they may not even accept these patients into their practice, for lack of an effective behavioral management strategy. In this case, the practitioner must be prepared to talk to the parents about professional limitations and discuss the importance of preventive care for young children, then refer children out appropriately.

Strategies for Behavior Management

Once each of the previous four determinants has been assessed, a strategy for behavior management can be developed.

Pre-Appointment Behavior Management

Behavior management can begin before the patient even comes in for the first visit.[1] Since parents and sometimes older siblings set the tone for the child's expectations of a first visit to the dentist, it is important to make certain the family is representing the upcoming experience appropriately. Several videos and children's books are available with positive representations of the dental experience. These might be recommended for family viewing or reading ahead of time. Pre-appointment mailings with a description of the practitioner's treatment style, an outline of first visit procedures, and a list of euphemistic terminology may also help the parent prepare the child or, conversely, help prevent the parent from "overpreparing" the child. Although not likely to influence the precooperative child significantly, these procedures may help with the compensatory, overprotective, or even hostile parent, thus reducing the impact of at least one factor on potential negative behavior.

If a child has older siblings who receive regular dental care, it might be prudent to invite the child to observe the periodic oral evaluation of the sibling. This is most useful with children who are borderline cooperative.

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Environment

Attention to the office environment can also influence child behavior before specific management strategies are determined.[1] A positive approach from a friendly and organized office staff with a team approach to treatment can create a positive environment for a child's first dental experience. The child can feel cared for and inspired to behave in a pleasing manner. Office flow and efficiency are also important. Studies indicate that offices with high production and greater time pressure tend to result in more negative behaviors in children.[16] Attire is another aspect of the environment that can be changed preemptively to address behavior. It has been suggested that some children react unfavorably to white coats. Thus, many dentists with high pediatric populations wear colored clothes or scrubs. Similarly, facemasks may induce apprehension in children who have experienced medical interventions. Many practitioners wait until just before treatment to introduce the facemask and gloves. Not only does a positive office environment set the tone for the child, it also sets the tone for the parent.

Communication

Communication has a twofold purpose in managing the child. It is preventive behavior management, setting the tone of the environment into which the child enters. Later, it becomes a part of the behavior management strategy. Communication is the mechanism by which the dentist conveys the nature of the relationship with parents and child, the expectations of all parties, and the parameters in which all will operate. Communication can be verbal, making word choice extremely important in establishing the environment. It may also be nonverbal, with postural changes, facial expressions, hand gestures, eye contact, and physical touch all conveying information to the child and parent. Either way, communication must be appropriate to the developmental age of the patient and the cultural context of the family.

Verbal communication can take place with various sources. With a well-trained staff, words of affirmation can be given to the patient from the doctor, assistant, or receptionist. Expectations for behavior can also come from these multiple sources. Multiple targets may also be used to convey information. For example, affirmation can be given to the child for good behavior by telling the assistant or the parents how well the child is doing. Similarly, explanations about potential behavior management strategies can be given to the parent in the hearing of an uncooperative child. Additional, messages about oral hygiene or the importance of dental treatment can be conveyed to the par-

ent through verbal instructions given to the child. With any of these methods, tone of voice and additional nonverbal communication can be used to reinforce the message.

In today's multicultural context, special consideration must be given to verbal communication when a child and his or her family do not speak English. If the practitioner doesn't speak the language of the family, then an interpreter may be necessary. Many offices employ auxiliaries with the languages skills represented by the surrounding community. In this case, emphasis must be placed on training the auxiliaries to communicate in styles consistent with the dentist's. In any event, nonverbal communication becomes more significant.

Successive Approximation

The classic "tell-show-do" approach is the most commonly used method of behavior management. The clinician first explains the procedure to the child (tell), next shows an approximation of the procedure (show), and then actually performs the procedure (do). This strategy can be used in anticipation of negative behavior. It is most useful for the child who is progressing beyond the precooperative stage or an uncooperative child whose primary core issue is fear. Few willfully uncooperative children respond well to classic tell, show, do. It is also useful for dealing with parents, particularly compensatory or overprotective types, by demonstrating patience and concern. It can also be useful as a method of indirect communication to retrain parental vocabulary.

Successive approximations can also be used to gain patient acceptance of operative or other more invasive procedures. For example, if a child is beginning to react to the high-speed handpiece, the dentist might run the bur next to the tooth, checking for comfort level, then touch the back of the handpiece to the tooth. A feather touch of the bur to enamel is a suitable prelude before entering dentin. As the clinician progresses further into actual treatment, he or she can confirm with the child that, "This is OK, right?" Again, this strategy is most useful with the child whose core issue is fear and also

the slightly resistant child who is old enough to understand when behavior is exaggerated.

Distraction

For borderline cooperative children and fearful children, distraction may be an effective method of taking their minds away from the task at hand.[19] Some offices have television screens or even portable virtual screens. Music can be an enjoyable addition. For 4- to 6-year-old children, storytelling or singing may be effective ways of capturing and diverting attention. None of these methods has been thoroughly explored in the literature.

Behavior Shaping

Behavior shaping, or behavior modification, is probably the most commonly used nonpharmacologic method of managing children developmentally mature enough to behave.[1] Based on principles of social learning, it involves a series of reinforcements that eventually leads to desired or ideal behavior. In this process, the provider states the goal for the child or the task for the appointment, explains the necessity for treatment according to the child's understanding, and then sets expectations for the child. When negative responses emerge, appropriate behavior is reinforced, minor inappropriate behavior is disregarded, and major inappropriate behavior is disciplined. To engage in this activity, a child must be capable of good behavior. Hence, behavior shaping is not useful in the precooperative child.

Appropriate behavior is most commonly reinforced with praise. Praise is offered for any behavior the dental team would like to see repeated and for any steps toward desired behavior. It should be given immediately after the child's positive response and continued intermittently even after positive behavior has been established. Verbal reinforcement can be directed at multiple targets, telling the parent and the office staff how well the child behaved. Nonverbal positive reinforcement is also important, in the form of applause, pats on the shoulder, or high-fives.

Undesirable but tolerable behaviors can simply be ignored. Diversionary tactics, such as changing the subject or asking unnecessary questions, and bothersome behaviors, such as whining or interrupting, must be dealt with by devaluing the behavior's impact on the dentist. The provider can choose not to respond or even turn away from the child until either desired behavior or major negative behavior emerge. Then the appropriate response can be given.

> Voice control can be used as an attention-getting technique and is most useful for the willful or resistant child, rather than the fearful child.

Major negative behavior is much more difficult to handle. These behaviors include refusal to open mouth, kicking, screaming, and frank disobedience of commands. A number of disciplinary measures have remained in use over time. Among the common methods is voice control. Even in late infancy and the early toddler years, a sharp, loud, shouted command can be incredibly effective at gaining the child's attention.[20] Such commands, when accompanied by appropriate facial expressions and body language, can communicate displeasure and the gravity of the negative behavior. Voice control can be used as an attention-getting technique and is most useful for the willful or resistant child, rather than the fearful child. Another aversive method is the hand-over-mouth exercise, which has been decreasing in acceptability and in usage over the years.[21,22] Also geared toward the willfully uncooperative child, this method is to be used sparingly and only with the assent of the parents, primarily to gain the attention of the child. Hand-over-mouth exercise should not be used for precooperative children or physically or mentally disabled children. In the most commonly recommended protocol for hand-over-mouth exercise,[22] the dentist firmly places his hand over the child's mouth and calmly issues a command for the child to stop inappropriate behavior. As soon as the child calms down, the hand is removed, and the child is thanked for the improvement of behavior. A final disciplinary method is physical restraint. There are essentially two contexts in which physical restraint may be used. The first is for treatment of a precooperative child under emergent conditions. Generally, treatment involves either extraction or caries control when one or two teeth are involved. The intent is to avoid sedation for a quick procedure. Although these young children may be successfully restrained by the assistant and parent, use of a papoose board or Pedi-Wrap are most effective. Obtaining verbal consent, at minimum, is necessary for their use. Parents must understand that physical restraint is not punitive but is intended for the safety of the child. Although many young children forget these events, many still remember the environment and thus must be man-

aged carefully in the future. The second context is the willfully uncooperative child. Historically, the rationale behind the use of physical restraint for these cases, most often by papoose board or Pedi-Wrap rather than restraint by parent or assistant, was to subdue the willful behavior of the child. However, usage of this nature is becoming unacceptable in today's cultural context. Thus, proper assessment of the child's cooperative ability and the parent's attitude are absolutely essential. This method, possibly paired with hand-over-mouth exercise, is essentially the last resort for a child who should be able to cooperate and should only be initiated in partnership with the child's parent. The philosophy driving this strategy is to send a clear message to the child that he or she cannot manipulate the clinician. As with other methods, once desired behavior has been attained, praise should be given and the aversive method discontinued.

Among the behavior-shaping methods, disciplinary techniques, especially hand-over-mouth exercise and device-assisted physical restraint, appear to be losing favor with parents.[23-25] Among practitioners, also, there has been a decrease in use of aversive behavior management methods, with hand-over-mouth exercise decreasing the greatest in usage.[26] Indeed, there has been some negative reaction to hand-over-mouth exercise in recent years due to potential misuse of the technique by practitioners in the past.[21,22] With the availability of pharmacologic techniques, the practitioner must carefully consider his or her options before including aversive or disciplinary measures in the behavioral strategy for a child.

Retraining

For a child who has had multiple medical interventions or previous poor dental experiences, retraining is often necessary. This child is usually potentially cooperative but has some apprehension or fear. For most children, only one aspect of treatment is truly the antecedent event for their fear, yet any dental intervention is negatively linked with that experience. Essentially, the goal is to unlink negative associations and disassociate negative behaviors. The child must come to an understanding that some events are in fact quite simple. The provider must reacclimatize the child to various treatment interventions in a stepwise fashion. Communication and successive approximations are most useful for this purpose. Terms must be redefined, and trust must be rebuilt. Once a good relationship is established, retraining can be quite successful.

> Many times the child knows how to manipulate the parent, and removal of the parent establishes a new authority in the room.

Parent-Child Separation

The traditional policy for dental treatment for many years was to exclude the parent from the treatment area.[27,28] The idea was that the parent might interfere with the dentist's ability to establish a rapport with the child or that the parent might disrupt or delay dental care. Although many dentists prefer the separation, studies indicate that younger dentists are more prone to allow parents to enter the treatment area than older dentists.[28] Parents increasingly prefer to be present, indicating that they believe their children will feel better and that they themselves will feel better.[27] Some parents voluntarily exclude themselves, believing that their children will respond better. How helpful parental presence is depends on the parental personality and the child. An appropriate parent can ease the development of the relationship between the dentist and child. A compensatory, overprotective, or overindulgent parent can actually worsen the situation. Separation of the parent and child is most useful for a willfully uncooperative child, particularly if the parent is one of the just-mentioned three types. Many times the child knows how to manipulate the parent, and removal of the parent establishes a new authority in the room. Children who are in school will eventually respond, because they have become accustomed to external sources of authority. Again, obtaining verbal consent, at the least, is very important. Parents must understand the rationale behind the separation and the potential behavior-shaping methods that may be used. Parent-child separation should not be used in the precooperative child and is not useful for the child who is fearful.

The New Context

The One-Year Dental Examination

As the American Academy of Pediatric Dentistry adopts a policy of anticipatory guidance, a higher value is placed on developmentally paced preventive interventions. In addition, oral health programs in California supported by funds generated through Proposition 10 have also placed an emphasis on early intervention. The one-year dental exam should become an important part of each dental office's care of children. It is an incredibly sim-

ple process. The child's behavioral status is clearly precooperative, with freedom from dental disease in all but the most unusual situations. The only real determinant to consider is parental personality, yet most parents will understand that their child will be unable to cooperate and are willing to accept crying at this age. The knee-to-knee exam is the simplest way to examine the child and allows for a quick assessment of the eruption and disease status of the dentition. There are several benefits to initiating a one-year exam. First, this is a unique opportunity to educate the parent on oral hygiene and diet, potentially preventing or reducing future dental disease. Reduction of more invasive procedures and number of appointments decreases the emergence of negative behaviors.[10] Second, this is an opportunity to assess the personality of the parent and develop a plan for partnership. Since the child will seldom require treatment, the parent can be introduced to the office environment with minimal stress. Finally, this is a wonderful opportunity to expose the child to the dental environment in a pain-free and relatively positive experience. Over the next two to three years, various treatment interventions can be slowly introduced, allowing the child to acclimate at a developmentally appropriate time. In the event that a child should have to experience any restorative procedures, he or she has successfully accepted a full examination, radiographs, dental prophylaxis, and fluoride treatments multiple times. Thus, the importance of an early dental visit cannot be overemphasized.

Changing Family Dynamics

There is no doubt that American culture is changing. This, of course, is something we have come to accept as a norm. However, in the context of nonpharmacologic management of the behavior of pediatric dental patients, this shift is rather perplexing. Perhaps a legitimate question when observing contemporary family dynamics is "Who is in charge?" This question was addressed in 1990, in a guest editorial in *Pediatric Dentistry*,[29] and again in a 2001 feature in *Time* magazine.[30] Parents appear to be moving toward a more laissez-faire attitude toward parenting, possibly encouraged by child-care workers who have taught them to accept conflicts with the child as "differences of opinion" to be reasoned through. Thus the typical child today is lavished with freedom and given choices, yet lacks self-control. Perhaps as a consequence, there are new diagnostic categories for children.[31] Not only is there an increase in children with attention-deficit hyperactivity disorder, there is the increased prevalence of newer diagnoses such as conduct disorder, oppositional defiant disorders, and other disruptive behavior disorders. At the same time, professional guidelines indicate a change in the recommendations for effective discipline.[32] Spanking and verbal reprimands are far less favored when compared to time-outs and removal of privileges. Although the intent of these recommendations is good — to protect children from abusive situations — the result is a very narrow window of appropriate circumstances in which either spanking or verbal reprimands may be performed. This trend has most likely made parents feel guilty about the use of either intervention in any circumstance. Interestingly, in a 2002 survey of 577 diplomates of the American Board of Pediatric Dentistry[12] 88 percent of respondents felt that parenting styles had changed in their practice lifetime, with 92 percent believing that these changes were "probably or definitely bad." Most respondents (85 percent) also believed that these changes resulted in "somewhat or much worse" patient behavior. In concert with changing parental attitudes, the diplomates reported less use of assertive behavior management techniques.

> The practitioner must be aware of the parents' philosophy of childrearing and discipline, not only to partner effectively with them, but also to understand the effect of the family's dynamics on the child.

Social anthropologists and sociologists have written about the shift in thinking from a "modernist" perspective to a "postmodernist" perspective. Interestingly, the literature in the field of nursing contains numerous references regarding the effects of postmodernism in the health care context.[33,34] This shift in thinking is thought to have started around the 1970s, which approximates the decade many parents of preschool and elementary school-age children were born. In the postmodernist mindset, relativism is more acceptable than the absolute, the subjective replaces the objective, and personal experience and virtual reality are more important than societal norms or history. It is extremely difficult to define for a parent or child what "appropriate" or "acceptable" behavior is. It is offensive to "impose" an expectation on the child who is being encouraged to find his or her voice. Compounding the impact of this mindset is the fact that most dentists come from a more modernist mindset. Even younger practitioners, who may have grown up with

postmodernism as the prevailing thought, bear the influence of the modernist generation. The foundations of dental education are objective, as evidence-based dentistry has become the goal. Health care decisions cannot be carried out in a relativistic manner.

So what are we to do? Classic behavior-shaping methods are becoming unacceptable. Hand-over-mouth exercise has fallen out of favor even with dental practitioners, possibly as a result of the implications of abuse. Similarly, the use of physical restraint as a punitive measure may not be acceptable to most parents. Even voice control might be considered questionable to many parents concerned about maintaining their child's self-esteem. In addition, time-outs and removal of privileges are not disciplinary considerations in the dental context. In this new cultural context, probably the most important emerging need in approaching the pediatric dental patient is actually accurate assessment of the parents' behavior. The practitioner must be aware of the parents' philosophy of childrearing and discipline, not only to partner effectively with them, but also to understand the effect of the family's dynamics on the child. To do so, a future goal must be to increase focus on the study of new family dynamics. There must be increased understanding of the determinants of parental personality and efforts to develop new behavioral categories for children. And finally, we need to develop new management strategies that will be acceptable to this new generation. This is not an easy task and may involve the use of pharmacological methods or simply referring a child out for treatment elsewhere if the chemistry of parent, child, and practitioner is not conducive to nonpharmacological methods of treatment. Until these new strategies emerge, however, the most effective way of deciding how to approach the pediatric dental patient still involves an accurate assessment of the child's disease status and developmental determinants, an understanding of the parental type, and an appreciation of the clinician's own strengths and behavioral style. CDA

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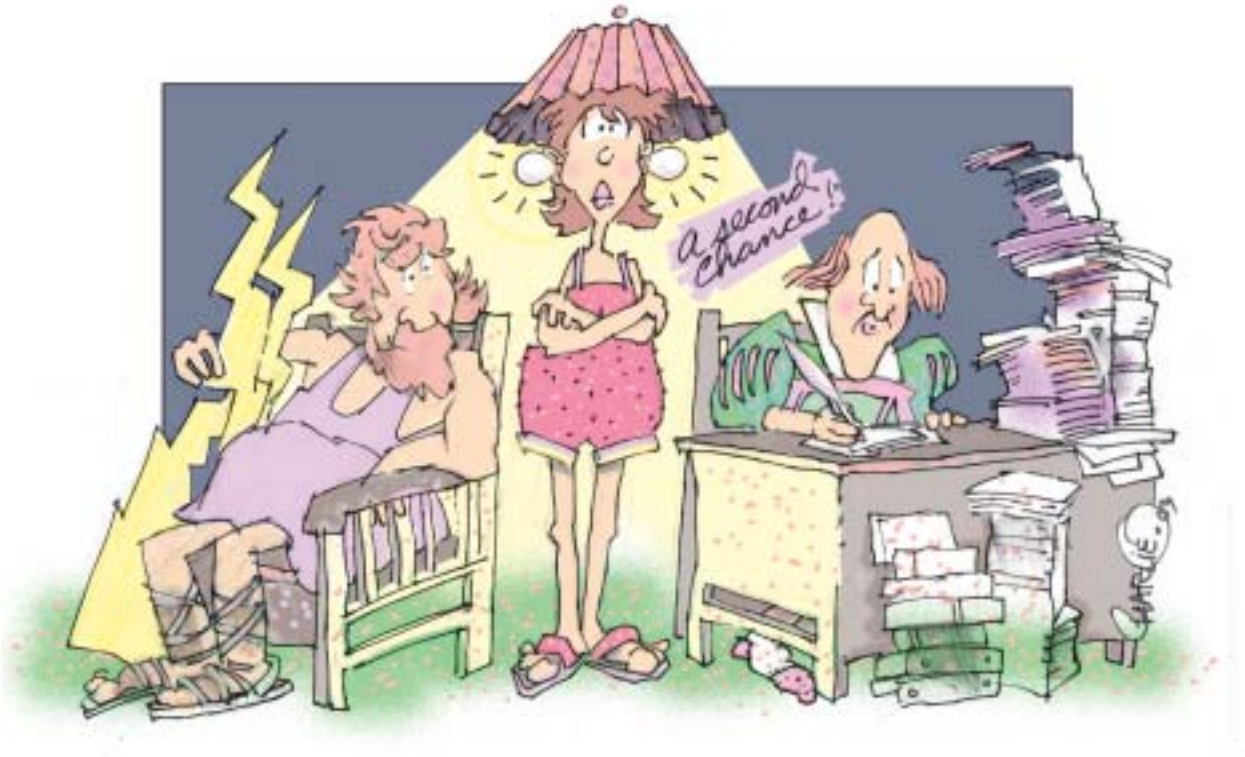
Robert E. Horseman, DDS

What Fools These Mortals Be



The critical elements are all in place. The storm is fast approaching the Greek holiday isle of Corfu. Up on Mt. Olympus, Zeus is poised with a thunderbolt in each god-like fist. The electrical potential between clouds and earth is ideal, and here is Robin Goodfellow reprising his gig in *Midsummer Night's Dream*. He is endlessly repeating the line William Shakespeare wrote for him, "Lord, what fools these mortals be!"

The fool in this instance is one Becky Nyang, a 26-year-old special services agent for Virgin Airways at Heathrow. Becky and her friend, sensing the approach of inclement weather, hustle from their interlude on the Corfu beach at Kavos back to the sanctity of their hotel.

They are crossing the courtyard to their refuge when it happens. The curtain goes up, not for Becky's friend, but for Becky herself, who is an au courant, happening mortal with a barbell piercing in her tongue and an attractive bit of iron thrust through her lower lip. In rapid sequence, Zeus launches his thunderbolt, Goodfellow reiterates his quote, and Becky suddenly has a nonspeaking role.

After it is determined that Becky is still among the living, as evidenced by a fogged compact mirror, she regains the power of speech, remarking, "When it hit me, all I could see was lightning. It was bright blue, and I couldn't see anything else. My body was shaking for 10 minutes." She has a pulse rate of 200 BPM, has a large bruise on her shoulder at the point of impact, and suffers from burns in her mouth where the lightning passed through the two metal piercings. Already she has been approached by five attorneys

The dental profession has taken a rather benign approach to oral piercings.

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who are ready and willing to take her case on a 25/75 contingency basis.

After two weeks, Becky finds sleeping difficult and is getting weary of people joking about the benefits of getting her batteries recharged on holiday. She reflects, "I have been given a second chance at life, and every second is precious. I thank God I'm alive." With every second precious, it would seem like a propitious moment to get down to Earl's House of Body Disfiguration to take advantage of that nose-piercing special, good until Thursday with coupon. Lightning never strikes twice in the same place; what are the odds?

It seems to us that the dental profession has taken a rather benign approach to oral piercings. Resisting the temptation to bodily heave the piercee out of the office, we offer a wussy warning that infections could result and teeth could be damaged, omitting the obvious fact that the pierced person looks like a complete idiot. Our attitude has somewhat echoed Shakespeare's observation. A more vigorous approach is needed to ensure that the population 50 years hence is not solely made up of tattooed, studded mutants.

Perhaps the ADA, in concert with the EPA and other governmental do-good agencies, should require persons desiring body enhancements to undergo certain safety checks. Cal Tech and MIT both have at their disposal high-voltage lightning simulators where they periodically blow up things for their own amusement and to qualify for government grants.

Perhaps the ADA should require persons desiring body enhancements to undergo certain safety checks.

Piercing aficionados would be certified as satisfying the requirements once they had been zapped with 100,000 gigavolts of ersatz lightning and remained sentient enough to care for themselves. It seems like a win-win solution. Becky Nyang concurs.

"I feel a bit different within myself as I know how close I came to losing my life and never seeing my loved ones again." These are the same loved ones who undoubtedly counseled her against having the metalwork done in the first place and who are now having trouble with their own tongues to avoid smugly noting "I told you so."

By the way, Ms. Nyang, Earl's will give you a substantial discount if you get the eyebrow, navel and nose piercings all at the same sitting. You should check with the National Weather Service before leaving the building.

Shakespeare had no comment. CDA