



# The Pathophysiology, Medical Management, and Dental Implications of Autism

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## A B S T R A C T

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.<sup>1,2</sup> 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.<sup>3</sup>

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 abstrac-

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tion are uniquely difficult for these people to complete.<sup>4</sup> 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**).

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.<sup>5</sup>

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<sup>1</sup>

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.<sup>6,7</sup>

### 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.<sup>8</sup> 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.<sup>9</sup> 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.<sup>10</sup> 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.<sup>11,12</sup> 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

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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.<sup>13</sup>

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.<sup>14</sup>

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.<sup>15-18</sup>

Numerous other etiologic theories

The clustering of these conditions in families with autistic people suggests the expression of an underlying predisposition to autism.

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.<sup>19-22</sup>

## 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.<sup>23</sup> 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.<sup>24</sup>

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.<sup>25-30</sup>

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.<sup>31</sup> 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.<sup>32</sup>

### 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),<sup>33-37</sup> orofacial side effects, and adverse interactions with drugs used in dentistry (Table 3).<sup>38,39</sup>

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.<sup>40</sup> 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 per-

mitting 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 be-

haviors. Side effects include diarrhea, nausea, dizziness, sexual dysfunction, and occasionally an increase in bleeding time.<sup>41,42</sup> 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 benzodi-

azepines 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.<sup>43</sup>

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.<sup>44,45</sup> 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.<sup>46,47</sup> 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<sup>33-37</sup>

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 hypothyroidism.
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 (akathisia, 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 (akathisia, 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 (akathisia, etc.).
Sertraline (Zoloft)	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 (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 anti-hypertensive 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.

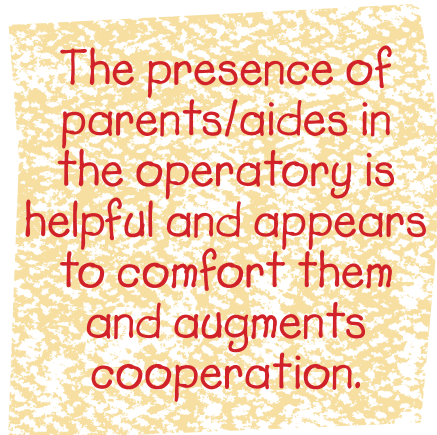
Methylphenidate tends to decrease hyperactivity and impulsivity and to improve attention span in patients with autism. As a central nervous system stimulant, the drug tends to promote anorexia and decreased weight gain in children along with insomnia and tachycardia. Long-term use may rarely cause thrombocytopenia, 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.<sup>48</sup>

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 se-



The presence of parents/aides in the operatory is helpful and appears to comfort them and augments cooperation.

dition.<sup>49</sup> 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.<sup>50,51</sup> 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.<sup>52,53</sup> 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.

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.<sup>54</sup> Long and involved treatment procedures are best performed in a surgical center or hospital setting under general anesthesia.<sup>55</sup> 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.<sup>56</sup> 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.<sup>48</sup> 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<sup>38,39</sup>**

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.

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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 hyperplasia
no	no	Periodontal abscess, sinusitis, neck pain

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