BERKOWITZ'S PEDIATRICS

A PRIMARY CARE APPROACH

6th Edition

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CHAPTER 132

Autism Spectrum Disorder

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CASE STUDY

The mother of 18-month-old twin boys is concerned because 1 twin is not talking as much as his twin sibling. Both twins are quite active. The mother feels that even though the child is quiet, he is very smart. He likes to figure out how things work. He seems very sensitive to sounds and covers his ears around loud noises. He loves music and even knows which CD his favorite song is on. He will interact with his sibling but does not seem interested in other children.

During the office visit, both boys are quite active. It is difficult to perform an adequate examination because the twin with limited language is crying the entire time. He does not seem to seek out his mother for comfort. Although both children have stranger anxiety, the twin about whom the mother is concerned seems to have extreme stranger anxiety. He appears well otherwise.

Questions

1. What is autism spectrum disorder?
2. How does autism spectrum disorder differ from language delay?
3. How does the physician evaluate a child for autism spectrum disorder?
4. Where can a physician refer a patient with autism spectrum disorder?
5. What types of treatment are available?
6. Should a child suspected of having autism spectrum disorder receive further immunizations?

Autism spectrum disorder (ASD) is characterized by impairments in social communication as well as restrictive, repetitive, and stereotypic behaviors or interests. According to the *Diagnostic and Statistical Manual of Mental Disorders,* 5th Edition (*DSM-5*), a person with ASD must display persistent communication, interaction, and behavioral challenges across multiple contexts. These disturbances must be present early on but may not be apparent until social demand exceeds the limitation. These characteristics must cause significant impairment and cannot be caused by cognitive impairment (Box 132.1). Cognitive impairment is often a comorbidity, however.

This new term, ASD, includes the previous terminology of autistic disorder, Asperger syndrome, and pervasive developmental disorder–not otherwise specified; the term ASD no longer includes Rett syndrome. Although criteria differ somewhat, all these disorders had in common an impairment in social communication and repetitive or unusual interests of varying degrees. These disorders require similar management and treatment, and assessing the level of impairment is somewhat subjective. Therefore, a single term—ASD—best incorporates all those individuals who are significantly affected by its symptomatology.

Box 132.1. Diagnostic Criteria for Autism Spectrum Disorder

- Deficits in social communication and interactions
  - — Social-emotional reciprocity
  - — Nonverbal communication
  - — Developing, maintaining, and understanding relationships
- Preferred patterns of behavior, interests, or activities
  - — Repetitive, stereotypic motor movements, use of objects, or speech
  - — Need for sameness, routines, and patterns of verbal or nonverbal behavior
  - — Fixated interests of abnormal intensity or focus
  - — Increased or decreased reactivity to sensory input or sensory aspects of the environment

Derived from *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition.

Epidemiology

As recently as 1999, the prevalence of ASD was thought to be 1 in 2,500. More recent numbers from the Centers for Disease Control and Prevention published in 2014 cite a prevalence of 1 in 59 children in the United States. The prevalence in Europe, Asia, and North America averages between 1% and 2% of the overall population. Boys are affected approximately 4 times as often as girls, which equates to 1 in every 38 boys. Affected girls are often more impaired than boys, however. Autism is considered the fastest-growing developmental disability. This increase is, in part, the result of an understanding of a broader phenotype.

Clinical Presentation

Autism spectrum disorder is truly a spectrum of social communication deficits. Although a certain set of behaviors defines the disorder, any child may have any combination of the symptoms that result in the same outcome—severe and incapacitating social deficits. Furthermore, the challenges experienced by this population are more than just developmental delays; the behaviors of these individuals are aberrant and odd.

Many children with an ASD have difficulty with eye contact and body posture. Even those who have some eye contact often do not use their eyes to convey a social message. They may look out of the corner of their eyes, focus only on the lips of the speaker, or look only infrequently. In other words, they may make eye contact but at the wrong time. They may talk to others with their bodies facing away from them. They may not gesture to help clarify intention.

Whereas some children have limited communication, some offer too much information. They may be quick to talk to others about things they are interested in but be unable to talk to their conversational partner about that person's own interests. They seem socially insensitive. As younger children, they are often entertained by their own interests for long periods. Some have limited need for relationships, but others desire interaction but do not understand how to initiate or maintain interactions. Although some of these children are nonverbal, some repeat or echo what they hear from movies, television, or nearby conversation. Others seem able to converse but have trouble with social banter. It is important not to be deceived by a child who interacts with others or even gives hugs but only on the child's own terms.

Children with ASD often have a fascination with patterns. The pattern may be in the form of household routines or within a particular subject area. This may manifest in an obsession for sameness and resistance to change or an obsessive need to know everything about a certain topic. Many know all there is to know about such favorite topics as Thomas the Tank Engine or dinosaurs from the Jurassic Period but cannot answer a question such as, "How are you?" or "What is your name?" They may be upset by a road detour or a furniture rearrangement. Some of these children, because of an incredible ability to recognize patterns, can read as early as 2 years of age, even though they can neither speak functionally nor comprehend what they read.

A significant portion of children have difficulty with sensory processing. This takes the form of problems with smells, tastes, sounds, sights, and touch. This symptom may be manifest in the need to taste everything, including nonfood items; covering ears in loud situations; or an inability to tolerate tags in clothing.

A huge variation exists in cognitive ability. The severity of ASD is independent of cognitive ability. Although approximately 25% of those with ASD have intellectual disabilities, many are of normal intelligence and some are gifted.

Parents or caregivers often raise behavioral concerns. It is important to recognize red flags and behaviors that demand further evaluation (Boxes 132.2 and 132.3). That is, certain classic symptoms exist, but the physician must be mindful of the child who is simply unable to connect with others. Physicians should rely on their own instincts. Inconsistent symptoms are the hallmark of this disorder. Some parents or guardians of children with an ASD describe a phenomenon whereby the children are developing normally until 12 to 15 months of age and then suddenly lose skills or stop progressing. This finding is particularly concerning.

Box 132.2. Common Aberrant Behaviors Associated With Autism Spectrum Disorder (ie, Red Flags)

- Decreased eye contact (common but *not* universal)
- Only wants to be cuddled on the child's terms
- Areas of unusual knowledge—recognizes entire alphabet by 2 years of age, all types of dinosaurs by 4 years, names of all Thomas trains, interest in fans or spinning items
- More interested in how things work than with playing
- Unusual sensitivities—oversensitive to hearing, bright lights, shirt tags, new foods, new places
- Smelling or licking nonfood items
- Repeating words instead of answering questions, or answering off topic
- Difficulty interacting with other children
- Plays amongst children, not with them
- Resistance to change, "very independent"
- "In his/her/their own world"
- Lines things up
- Unusual hand movements or jumping when emotional
- Things have to be a certain way
- Odd tone of voice (ie, prosody)
- Increased pain tolerance

Box 132.3. Indications for Referral for Evaluation

- 12 months of age: Not babbling or gesturing (pointing, waving)
- 16 months of age: No single words
- 24 months of age: Absence of 2-word phrases
- Loss of language or social skills at any age

Derived from Filipek PA, Accardo PJ, Baranek GT, et al. The screening and diagnosis of autism spectrum disorders. *J Autism Dev Disord.* 1999;29(6):439–484.

Pathophysiology

Numerous proposed etiologic possibilities for the origins of ASD exist, from the inbreeding of computer "whizzes" to exposure to microwaves. However, no consistent explanation or pattern has emerged. It is known that the structure of the brain is different, but the reason why remains unknown.

Up to 10% of those with ASD have another medical condition that might have led to this disorder (Box 132.4). This leaves 90% of patients without an etiology, however.

Genetics seem to play an important role in the development of ASD. A risk of the disorder among siblings of up to 20% has been reported, which is more than 10 times the risk in the normal population. Family members are more likely to exhibit social deficits, anxiety, or depression than are family members who do not have a relative with the disorder. Several candidate chromosomes have been suggested as being associated with this disorder, but no 1 locus is responsible for this disorder.

It is also important to realize that up to 30% of children with ASD have abnormalities on electroencephalography (EEG). This finding may point to the structural abnormalities in an autistic brain but does not seem to account for the disease itself. The epileptiform changes should be evaluated by a neurologist to determine if

Box 132.4. Medical Conditions Associated With Autism Spectrum Disorder

- Epilepsy
- Fragile X syndrome
- Tuberous sclerosis
- Prader-Willi syndrome
- Visual or auditory impairment syndrome
- Down syndrome (ie, trisomy 21)
- Cerebral palsy
- Neurofibromatosis
- Congenital rubella

medication is indicated. Without an outward expression of seizures, however, many patients do not opt for treatment.

Several environmental markers have also been suggested as being linked to ASD, but most have not proved credible. Major epidemiologic studies within the United States and internationally have examined the roles of vaccinations, diet, and thimerosal preservative in the development of this disorder. None of these studies has found proof to support these theories. Known associations include older paternal age, preterm birth, and jaundice. Several studies have suggested that pollution may play an epigenetic role.

Much of the newer research suggests a fundamental neurobiologic difference in the prefrontal cortex, which likely occurs as the result of abnormal neuronal overgrowth in the first 20 weeks of gestation. This suggests a genetic or epigenetic etiology before birth in 90% of patients with autism.

Children with ASD should undergo routine health maintenance, including all recommended immunizations. No evidence exists linking ASD with immunizations.

Differential Diagnosis

Few entities present with impairment in the same 2 domains as those that are affected by ASD. A limited number of disorders mimic ASD (Box 132.5). However, several disorders exist that commonly occur with ASD that, if not identified, make treatment more difficult (Box 132.6).

Box 132.5. Disorders That May Mimic Autism Spectrum Disorder

- Hearing impairment
- Global developmental delay
- Tourette syndrome and comorbidities
- Selective mutism
- Reactive attachment disorder
- Lead ingestion
- Sensorimotor integration dysfunction
- Severe auditory processing/language deficit
- Severe anxiety
- Severe attention-deficit/hyperactivity disorder
- Brain trauma
- Childhood-onset schizophrenia

Box 132.6. Disorders That Can Occur With Autism Spectrum Disorder

- Tuberous sclerosis
- Congenital blindness
- Global developmental delay
- Chromosomal abnormalities (eg, Down syndrome, fragile X syndrome, Prader-Willi syndrome)
- Phenylketonuria
- Epilepsy
- Elevated lead level
- Congenital infections
- Brain trauma
- Bipolar disorder
- Neurofibromatosis
- Congenital profound hearing loss
- Tourette syndrome
- Landau-Kleffner syndrome
- Inborn errors of metabolism
- Anemia
- In utero exposure to drugs and/or alcohol
- Depression and/or anxiety
- Attention-deficit/hyperactivity disorder

Evaluation

No single diagnostic test, blood or otherwise, can confirm the diagnosis of ASD. Diagnosis is based on history, interaction with the child, and meeting *DSM-5* criteria.

History

Regular developmental surveillance and screening should be part of every well-child evaluation, especially between ages 9 and 30 months. In 2019, the American Academy of Pediatrics recommended that pediatricians conduct developmental and behavioral surveillance during all well child visits, developmental screening at the 9-, 18-, and 30-month visits, and standardized screenings of patients for ASD at 18 and 24 month. Special attention should be given to a child who has a sibling with ASD or a child whose parent or caregiver has expressed concern. Several standardized screening tools can be used, including the Parents' Evaluation of Developmental Status or the Ages and Stages Questionnaire, to identify developmental and social competency skills and concerns. The Modified Checklist for Autism in Toddlers, Revised, with Follow-Up (M-CHAT-R/F) is an excellent autism-specific screening tool with moderate sensitivity and high specificity for use at the 18- and 24-month visits to identify individuals at high risk for ASD. A positive M-CHAT-R/F screening is associated with ASD in 50% of patients and with developmental delay in 90% of patients. These screening tools are quick and easy and can be completed by the parent or caregiver in the waiting area or with minor assistance from office personnel.

For the child with suspected developmental difference, the physician must gather as much information as possible. Thorough birth and medical histories are important in helping to understand if early experiences may have predisposed the child to any deficits. For example, children born preterm are at increased risk for ASD. Monozygotic and dizygotic twins have high concordance. Older fathers or infertility treatments may have a role as well.

Family history is also important, because ASD is presumed to have a genetic contribution and it may be helpful in identifying other etiologies. Understanding family structure is helpful in determining whether abuse, neglect, or maternal depression play a role in the child's delay. It is important to remember, however, that ASD is not caused by poor parenting.

Developmental history is a critically important part of the history. The physician must probe all 4 areas of development: fine motor, gross motor, language, and social development (see Chapter 32). As stated previously, it is expected that the most significant delays will be in language and social interaction; however, delays may be noted in all components of development. Additionally, probing for abnormal behaviors specific to ASD helps distinguish this disorder from others. Box 132.7 contains some suggestions that may help elicit information relevant to a diagnosis of ASD in a toddler; the history should be adjusted based on the age of the child. The physician should always include early language milestones. Children with ASD tend to have *splinter skills*, that is, skills that may be normal or above developmental level for age. The physician should not let these skills distract from probing areas of suspected delay.

Finally, parents/caregivers and physicians often fall victim to common myths and excuses about development because it is not easy for many parents to discuss or admit delays (Box 132.8). These myths, although they may seem plausible, are not substantiated and only serve to further delay onset of intervention.

Physical Examination

A thorough physical examination with special attention directed to the growth parameters, neurologic examination, dysmorphic features, and neurocutaneous stigmata are essential to a complete evaluation. Height, weight, and head circumference should be plotted. Twenty-five percent of children with ASD have a head circumference greater than the 97th percentile. That is not to say that everyone with a large head has ASD, only that it is an associated feature. In utero infections may predispose to a small occipitofrontal circumference, but both a large and a small head circumference have developmental implications for ASD.

Detecting subtle physical signs, such as clinodactyly, simian crease, or a high-arched palate, although not diagnostic, is somewhat helpful in raising suspicion for neurodevelopmental delays. A Wood lamp evaluation may be helpful in uncovering neurocutaneous stigmata.

A series of dysmorphic features, such as a thin upper lip, flat philtrum, and upturned nose, may be suggestive of a syndrome, such as fetal alcohol syndrome. Hypotonia is a common finding among children with ASD but may be suggestive of an inborn error of metabolism. The physician must also check reflexes, because degenerative

Box 132.7. What to Ask

Autism Spectrum Disorder

Questions to Ask Parents/Caregivers

- Does your child seem to hear you? Did your child undergo a hearing test in the neonatal period?
- Does your child make noises? If so, what kind?
- When did your child say his, her, or their first word after "mama" and/or "dada"? Does your child have 2-word phrases?
- Are there any other behaviors that concern you?
- Can your child scribble? Has your child lost any skills? Does your child line things up?
- When did your child first walk? What does your child like to play with?
- Do tags on the back of clothes bother your child?
- Is your child interested in other children? What does your child do upon seeing another child in a park?
- When do you first remember your child pointing with 1 finger?
- Does your child play peekaboo? Will your child try to engage you?
- Does your child talk into a play telephone?
- Does your child eat a variety of foods?
- Does your child turn when you call him, her, or them?

Questions for the Physician to Ask Oneself

- What does this child's autism specific screener show?
- Do any complicating historical factors exist that may predispose this child to a developmental problem?
- Is this merely personality variation, or does this represent delays and aberrant behavior?
- Is this a language delay, or does concern exist for more social or odd behaviors?
- What should be done to evaluate?
- What types of intervention would be helpful?

Box 132.8. Common Excuses for Unusual Behaviors in Children With Suspected Autism Spectrum Disorder[a]

1. We speak 2 languages at home. (By age 3 years in a bilingual home, language should follow a normal progression. Social and unusual behaviors should always follow a normal trajectory.)
2. He is a boy. (This is accounted for in the range of normal.)
3. She is a twin. (If 1 twin has autism spectrum disorder [ASD], the other twin has an increased risk of having ASD or being delayed developmentally.)
4. He is the first child. (There is no evidence that firstborn children speak late.)
5. She is the baby. (There is no evidence that children born last speak late.)
6. He is having a bad day.
7. She watches too much television. (Neglect can result in delays, but these children still need intervention.)

[a] These are *not* reasons to delay evaluation.

disorders (eg, muscular dystrophy) can present with *language delay*, that is, isolated delay in the acquisition and expression of language.

One of the most useful examinations in the office is to simply have a conversation with an older child or play with a younger child. The physician can bring out bubbles and engage in a popping game, watching the child's eyes and observing the child's interaction with the physician and the parent or caregiver. The physician can pretend that the otoscope is a telephone that is ringing and then pick it up, talk briefly, and pass it to the child. The physician should watch the child's response. Does the child play with you, with only the bubbles, or with neither? Does the child display repetitive flapping when excited?

Laboratory Tests

No single laboratory or radiologic evaluation is diagnostic for ASD. The real keys to diagnosis are developmental surveillance, screening, and observation. Some tests are helpful to rule out comorbid conditions, however. If the child has not undergone an audiologic evaluation, that should be done first. However, the physician should not wait for audiology results before referring the patient for help. From a medical perspective, a tiered approach to the workup often is helpful. The first tier includes laboratory studies, such as a chromosomal microarray analysis (eg, comparative genomic hybridization) and a DNA test for fragile X syndrome. A lead level, carnitine profile, plasma homocysteine levels, serum amino acids, urine organic acids, thyroid evaluation, and vision evaluation should be assessed in children with global developmental delay, loss of developmental milestones, or other findings concerning for neurological or developmental disorders. If the symptoms are severe, ammonia, lactate, and pyruvate levels should also be measured. An EEG is appropriate if concern for seizures exists. The results of the newborn screening should also be reviewed. In the absence of specific clinical findings, the yield of these diagnostic studies is anticipated to be low (approximately 7%) but, if positive, may aid in the recognition of a specific comorbidity.

The second tier of tests, if necessary, includes an evaluation for specific rare diseases. Some consideration might be given to chromosomal 15 methylation, methyl CpG-binding protein 2 (in males and females), phosphatase and tensin homolog deleted on chromosome 10, fibroblast karyotype if pigmentary abnormalities are noted, sterol profile, guanidinoacetate urine analysis (only in males), or other associated genetic evaluations. According to current literature, laboratory evaluation for ASD yields an etiology in 15% of patients.

Imaging Studies

Magnetic resonance imaging should be considered for the patient with a history of regression or microcephaly, or in the presence of focal findings suggestive of central nervous system malformations; otherwise, it is considered low yield for detecting any abnormality of diagnostic significance. The child with regression, more significant involvement, or behavior suspicious of a seizure should undergo EEG. Although positron emission tomography and single-photon emission computed tomography show abnormalities, these studies are not sufficiently specific for diagnosis or to direct care. These studies are not warranted in a child with ASD; they are used primarily in the research setting.

Management

Diagnosis of ASD is sometimes challenging, but early diagnosis is critical in changing ultimate outcomes. Waitlists to see specialists and a limit on the number of specialists in this field makes it imperative for the primary care physician to be able to make the diagnosis of significant autism. The primary care physician who makes the diagnosis of ASD in a child who is older than 2 months of age with significant symptoms is correct more than 90% of the time. Because early intervention can have such a vital effect on patient outcomes, the American Academy of Pediatrics has made early diagnosis and intervention, which can reduce the cost of lifelong care by two-thirds, a priority. The diagnosis of ASD is based on the *DSM-5*.

Because children 3 years and older receive services through the local public school district, children younger than 3 years should be referred to other local governmental agencies. Most states have a government-sponsored early intervention program for children up to 3 years of age that is responsible for the evaluation of as well as the behavioral, educational, and therapeutic interventions for children with suspected delays. Such agencies offer comprehensive diagnostic evaluation and placement of eligible children in an intensive intervention program. Therefore, after a hearing test has been completed, referral to such an agency is the next step. On average, it takes 6 months from the time a child is seen in a physician's office to the attainment of such services. Thus, it is important to identify eligible children before age 30 months. Furthermore, such services are covered by private insurance in many states. It is important for primary care physicians to make such referrals.

For children older than 3 years with moderate to severe impairment, the responsibility for evaluation and treatment lies with the local school system, medical insurance, and government-sponsored agency. Even before a child is of school age, the child's local school district is responsible for the evaluation and interventions necessary to implement appropriate remediation. Physicians should verify with local agencies to determine whether such a system exists in their respective state, however. Between ages 3 and 21 years, each child is entitled to a free and appropriate education guaranteed under the federal mandate known as the Individuals with Disabilities Education Act. By law, educational programs should be comprehensive and individualized to the needs of each child. Following the assessment, teachers and other school personnel meet with parents to develop an Individualized Education Program (IEP) for the child.

Most children with ASD require, at minimum, speech and language services, occupational therapy, and social skills training. Many require a 1:1 aide in a mainstream class, and others benefit from special education services in the form of pullout or a special day class. Additional services to augment those provided in school can be given privately. Some states have mandated that medical insurance support these additional necessary services; however, in other states these additional services are the sole responsibility of the parent or caregiver.

Interventions

Autism spectrum disorder is a neurologic condition that can improve with intensive multimodality interventions. This improvement is

slow. No quick solutions, magic medications, or diets exist to "cure" ASD. Behaviors such as impulsive aggression, repetition, resistance to change, and obsession are frequently targeted by systematic interventions. Furthermore, some basic social learning behaviors can be shaped by different types of intervention. Several different techniques based on different psychological principles exist that may be used to help improve the difficulties associated with ASD (Box 132.9). The best studied therapy is known as *applied behavior analysis*, in which a child's behavior is scrutinized by a trained behaviorist and goals and trials are developed to slowly shape appropriate responses. The parent or caregiver is then taught the skills necessary for the desired outcome.

Speech and language services are vital to intervention. The initial goal is to help establish communication. In higher-functioning children who already have established language, this service is vital to the establishment and development of prosocial language, such as eye contact, inferences, understanding jokes, and the more subtle aspects of language. Social skills groups are often used to teach appropriate social responses in a seminaturalistic environment.

Occupational therapy is often necessary to help with fine motor skills and the processing of sensory information. Such therapy can be helpful in easing transitions. Although not much has been published to support the use of occupational therapy for sensory concerns, it is a widely accepted premise that sensory exposure helps children with an over- or undersensitive sensory system.

Special education in the form of an aide, classroom pullout, or special day class often is necessary to help with commonly associated learning difficulties. A child with an ASD may have a full array of learning difficulties. Commonly associated learning difficulties are in reading comprehension, written expression, and auditory comprehension; additionally, a child may have specific math disability.

Under the law, these services should occur in the least restrictive and most appropriate environment.

Box 132.9. Techniques Used in the Management of Autism Spectrum Disorder

Floortime

This intervention uses personal relationships and play in the child's area of interest to draw the child through increasingly complex developmental tasks.

Applied Behavior Analysis

Applied behavior analysis strives to achieve pre-academic skills, such as eye contact, imitation, sitting, and following simple directions using the principles of conditioning and behavioral psychology. In a 1:1 fashion, a child is trained to respond in a predetermined way using a specific curriculum and reinforcers.

Behavior Analysis

This method uses close study of behaviors to determine antecedent triggers and consequences, such as a tantrum. The goal is to substitute acceptable responses, such as using words, and increase rewards for substituted behaviors.

Pivotal Response Treatment

This strategy uses principles of behavior analysis as well as the child's interests and internal drives to motivate with the aim of generalizing the skills from a therapy room to a variety of environments. Children with an autism spectrum disorder often have difficulty performing a previously mastered skill in a new setting.

Picture Exchange Communication System

The Picture Exchange Communication System uses pictures that the nonverbal child can use to show a caregiver what the child wants.

Treatment and Education of Autistic and Related Communication Handicapped Children

The Treatment and Education of Autistic and Related Communication Handicapped Children is a complete program that incorporates the child into a large autism spectrum disorder community. The goal is to promote autonomy; the program uses many methods based on cognitive therapeutic principles.

Social Stories

These are often used as a complementary strategy. These stories describe in detail basic social skills in different scenarios.

Pharmacotherapy

The mainstay for treatment of ASD remains behavioral. Although medications do not seem to help the core symptoms of ASD, almost 2 in 3 children with ASD receive medications for behaviors that, despite intensive behavioral intervention, continue to obstruct progress or become dangerous.

Only 2 drugs have been approved by the US Food and Drug Administration for use in children with ASD. Risperidone and aripiprazole are approved for the agitation associated with this disorder. Other medications may be prescribed for other behaviors seen in children with ASD. The choice to use medication is not simple. The purpose of the medication should be to address emotional or psychological function causing the symptom. The most common medications include selective serotonin reuptake inhibitors and stimulants. However, research and clinical experience indicate that children with ASD are more sensitive to side effects and at lower doses. Therefore, the choice and direction of medication management in this population is often best guided by a developmental-behavioral pediatrician, neurologist, or child psychiatrist (see Chapter 134).

Alternative Treatments

A variety of alternative treatments have been suggested. Secretin injections, dietary restrictions, chelation, high-dose vitamins, antifungal agents, and neuron injections are just some of the interventions considered as part of alternative treatments. Anecdotal improvement has been reported with some of these methods; however, others are dangerous and have resulted in death. None of these methods is considered traditional or the standard of care, because minimal empiric data exist to support their use.

Prognosis

While many children show dramatic improvements with early intervention, others show minimal improvement. Therefore, all children need both early and ongoing intensive interventions to ensure the best possible outcome. Some prognostic indicators, such as IQ, early and intensive interventions, and a supportive family, bode

well. Obtaining an accurate IQ is often challenging. The major determinant of ultimate outcome seems to be progress in a comprehensive, early intervention program for a duration of 2 years before the child reaches age 5 years. Having little or no language by age 6 years is a poor prognostic indicator. Therefore, the goal remains focused on early identification, intensive treatment, and advocacy for children to receive such interventions with ongoing support throughout their preschool and school years.

Intensive early intervention programs have been available only since approximately 1995. Since that time, children with ASD have moved into the mainstream. Despite receiving early intervention, these children continue to have problems with transitions, more complex social interactions, and higher-level organization tasks. Thus, physicians must continue to advocate for and support these families in an ongoing longitudinal manner.

Many adults with ASD continue to require significant support. They may require sheltered living and work environments, safety monitoring, and ongoing medical support. Persons with severe ASD may receive care in group homes.

Another significant proportion of children with ASD attend college, marry, and have children. It is difficult to quantify the number of persons with ASD who achieve these milestones, because the numbers change rapidly, and the true number of children with ASD remains unknown.

CASE RESOLUTION

The child's parent completed an M-CHAT-R/F, and the child scored a 4 (ie, intermediate risk). A follow-up interview confirmed that the risk for ASD was significant, and the child was evaluated by a developmental-behavioral pediatrician and the local governmental agency, where he underwent a comprehensive assessment by a multidisciplinary team. The diagnosis of autism was confirmed, and his brother was noted to have a language delay. Both children were placed in an early intervention program. The primary patient was placed in a 1:1 structured teaching environment for 4 months. After exhibiting significant improvement, he was moved to a therapeutic preschool setting that emphasized generalization of his newly acquired skills, speech therapy, occupational therapy, and social skills. His brother received speech therapy 2 times per week. Both are due to start a regular kindergarten class in the fall, with ongoing speech and social support. The primary patient has been placed on a stimulant medication to control hyperactivity and problems with attention.

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