Management of a Hyperactive Teen and Cardiac Safety

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KEYWORDS

• Attention deficit hyperactivity disorder • ADHD • Arrhythmias
• Sudden cardiac death • Electrocardiogram • QT interval • Hypertension
• Tachycardia

KEY POINTS

- Stimulants improve behavior yet can be associated with cardiovascular effects of increased heart rate and blood pressure changes.
- The risk of sudden death is not increased over that of the general population.
- Routine ECG monitoring is not indicated.
- Patient compliance with medication regimens is often suboptimal.

INTRODUCTION

Although possibly described as early as the 17th century, distraction of attention was recognized and reported as an adverse behavioral condition by Dr Alexander Crichton in 1789 in his medical treatise on mental illness, "An Inquiry into the Nature and Origin of Mental Derangements." In his series of 3 books, he describes patients who are easily distracted by even the slightest extraneous stimuli. This inability to focus on any one task, which he describes as a morbid alteration of attention among such patients, causes them to become hyperexcited and exhibit what was described as having the fidgets.[1] In 1846, as 1 of 10 short stories of various childhood behaviors included in his children's book, *Struwwelpeter* (Slovenly Peter), Dr Heinrich Hoffmann introduced the fictitious character of "Zappel-Philipp" (Fidgety Philip).[2] Fidgety Philip, although perhaps not directly implying any mental disorder, does illustrate several of the now-accepted criteria for attention deficit hyperactivity disorder (ADHD): inattention, hyperactivity, and impulsivity. In addition, he describes his character's behavioral effects on parents and family.

However, a more definitive description of the disorder was published by Dr George Still (of the innocent Still's murmur fame). A pediatrician, Dr Still became involved in

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childhood disease research and in his treatise, "On Some Abnormal Psychical Conditions in Children," published in 1902, he described children with a morbid defect of moral control but without evidence of physical disease or impairment of intellect, to distinguish these children from those with associated physical conditions such as meningitis, brain tumor, head injury, or mental illness.[3] His work was followed by numerous authors over the ensuing decades, with descriptions of childhood hyperactivity, inattentiveness, compulsive behavior, ease of excitability, and inability to concentrate.[4] Accordingly, the condition itself has been associated with controversy as to its actual existence as a neurodevelopmental disorder and has undergone several name changes, culminating in the current ADHD designation in 1987.

In 1994, the condition was subdivided according to clinical presentation:

- ADHD inattentive
- ADHD hyperactive-compulsive
- ADHD combined.

Between 5% and 20% of school-aged children are currently diagnosed with ADHD; boys more frequently than girls. Although previously thought to be only a childhood disorder, over 50% of individuals diagnosed in childhood continue to exhibit symptoms as adults. Causal theories have varied over the years. Although a precise single cause of ADHD remains controversial, at present, environmental, genetic, as well as neuropsychological factors have been included. A genetic inheritance factor has been indicated in 75% of affected children.[5]

Possible cause includes

1. Environmental factors
   - Preterm and very low birth weight infants
   - Fetal alcohol and tobacco exposure
   - Fetal or childhood infections
   - Lead exposure
   - Food additives
   - Polychlorinated biphenyls exposure
   - History of physical or emotional abuse
   - Congenital heart repair before 1 year of age
2. Genetics
   - Genes associated with dopamine transportation
   - LPHN3 gene, which facilitates responsiveness to stimulant medications
3. Neuropsychological
   - Inability to regulate and manage daily tasks (executive functioning)

Because executive functioning evolves with age and brain maturation, this last concept helps to explain why symptoms of ADHD may not become fully manifest until adolescence or young adulthood.

DIAGNOSIS

Depending on which criteria are used (DSM-IV or ICD-10), children may or may not be correctly identified as actually having ADHD. It is beyond the scope of this writing to elaborate on actual testing techniques but suffice to say that all are based on an assessment of individual behavior and cognitive development, especially in regards to age-matched peers, taking in account parental and educator assessments. ADHD is based on behavior and is not a neurologic disease. As such, it differs from other psychotic/mental disorders, such as schizophrenia, anxiety, or personality disorders. It is classified as a disruptive behavior disorder with oppositional defiance