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REVIEW

Attention-deficit/hyperactivity disorder

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Abstract

Attention-deficit/hyperactivity disorder is a common neurobehavioural disorder that compromises the core symptoms of developmentally inappropriate levels of inattention, impulsivity and hyperactivity. Many patients are still not diagnosed, or do not receive appropriate sustained treatment, in spite of a general greater awareness of the disorder. With such a high prevalence, the clinician needs to be well-informed about the presentation, treatment and challenges associated with this complex disorder.

Keywords: attention-deficit/hyperactivity disorder, ADHD, methylphenidate, atomoxetine

Introduction

The following patients with attention-deficit/hyperactivity disorder (ADHD) may present to the medical practitioner:

- Preschool children with behavioural problems, i.e. who always fidget, do not follow directions, talk excessively and are unable to sit still
- Schoolchildren who blurt out answers, interrupt teachers and daydream in class, and perform poorly academically
- Adults who lose their jobs because they make careless mistakes, miss deadlines and forget appointments.

ADHD is a neurobehavioural disorder, with the core symptoms of inattention, hyperactivity and impulsivity, which compromise academic, social and emotional functioning. A diagnosis of ADHD is made based on behavioural symptoms, according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM)-5 criteria.[1] The symptoms need to be assessed according to the patient's age and developmental level, as some of them may be normal at different stages of development. The diagnosis of ADHD is usually made in childhood, but the symptoms often persist into adulthood. The prevalence of ADHD in children is from 3-10%, and it appears that boys are affected 3-4 times more often than girls. Growing up does not eliminate the disorder as ADHD in 30-50% persists into adulthood. Unfortunately, numerous patients discontinue treatment and only 1% of adults are still on treatment by the age of 20 years.[2,3]

ADHD is a neurobiological disorder and has 75% hereditability, with a fivefold increased risk in first-degree relatives. Multiple genes have been identified that are involved in dopamine and serotonin neurotransmission. It seems that gene-environmental interactions contribute to the expression of the phenotype. Prenatal environmental risk factors include hypoxia, lead or polychlorinated biphenyl exposure, prematurity, low birthweight, alcohol (foetal alcohol syndrome) and nicotine exposure, while acquired risks include encephalitis and brain trauma. This leads to frontostriatral monoamine dysfunction, which can be visualised during experimental functional magnetic resonance imaging. Even though the pathogenesis of ADHD is better understood than it was previously, biomarkers, routine electroencephalograms, brain imaging and thyroid hormone levels are not indicated in the evaluation of ADHD, unless indicated by other findings during the clinical evaluation as this knowledge still needs to be integrated into a common hypothesis in order for this neurodevelopmental disorder to be fully understood.[3-5]

Diagnosis

The diagnosis of ADHD is clinical and a thorough clinical evaluation is required. A full developmental history, medical examination, and academic and psychosocial assessment is needed to confirm the presence and extent of the core symptoms, to identify co-morbid psychiatric and learning disorders, and to exclude other possible causes for the presenting symptoms.[2] Information from more than one setting, e.g. home and school, is needed when conducting an evaluation for ADHD. A questionnaire can be helpful when communicating with teachers, and preferably via a confidential route, e.g. direct e-mail or a facsimile to the medical practitioner. A diagnosis of ADHD is usually made in children, but often the parents of these children recognise the syndrome in themselves retrospectively. This, as well as a greater awareness of ADHD in adulthood, has opened up the possibilities for the diagnosis and treatment of adults with ADHD.[3,6]

To diagnose ADHD according to the DSM-5 (Table I):

- The symptoms should have had an onset before the age of 12 years
- Have lasted for at least six months
- Have been present in at least two settings, e.g. school, work and home

Table I: The symptoms of attention-deficit/hyperactivity disorder, according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

The symptoms of ADHD according to the DSM-5	
Inattention	**Impulsivity and hyperactivity**
1. Often fails to pay close attention to details or makes careless mistakes	1. Fidgets with (his or her) hands or feet, or squirms in the seat
2. Often has difficulty sustaining attention in tasks or play activities	2. Often leaves the seat in situations when remaining seated is expected
3. Often does not seem to listen when spoken to directly	3. Often runs about or climbs in situations when it is inappropriate. (This may be limited to feelings of restlessness in adolescents and adults)
4. Often does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace, e.g. starts tasks quickly, loses focus, and is easily distracted	4. Is often unable to play or engage in leisure activities quietly
5. Often has difficulty organising tasks and activities, i.e. difficulty managing sequential tasks, keeping materials and belongings in order, (and includes) messy, disorganised work, poor time management, and a failure to meet deadlines	5. Is often "on the go", acting as if "driven by a motor"
6. Often avoids, dislikes or is reluctant to engage in tasks that require sustained mental effort	6. Often talks excessively
7. Often loses things necessary for tasks or activities, e.g. school materials, mobile phones, keys, wallets, paperwork and books	7. Often blurts out an answer before the question has been completed, e.g. completes people's sentences, and cannot wait for his or her turn in the conversation
8. Is often easily distracted by extraneous stimuli. (This may include unrelated thoughts in older adolescents and adults)	8. Often has difficulty waiting his or her turn, e.g. while waiting in line
9. Is often forgetful during daily activities, e.g. doing chores, running errands, returning calls, keeping appointments and paying bills	9. Often interrupts or intrudes on others

ADHD: attention-deficit/hyperactivity disorder, DSM-5: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

- Should have interfered with functioning, with six of the nine symptoms of inattention being present in children (five of the nine symptoms in adolescents or adults aged ≥ 17 years) and/or six of the nine symptoms of hyperactivity and impulsivity in children (five of the nine in adolescents or adults aged ≥ 17 years).

A new diagnosis in an adult should only be made after a comprehensive assessment, including collateral information from adults who knew the person as a child, where possible.[1,6]

Untreated ADHD impacts on development. Escalating sequelae influence the presentation. It is mostly behavioural disturbances that warrant treatment seeking during the preschool years, but as soon as school starts, academic impairment and poor social interaction compromise the child's position. During adolescence, this can snowball into a low self-esteem, criminality and smoking, with possible substance abuse, and injury and accidents later in life. This may leave the adult with further relationship problems and unemployment.[3]

Co-morbidities are more the rule than the exception, with 80% of patients having a co-morbid psychiatric condition. ADHD presents together with other neurodevelopmental disorders in children, like learning and communication disorders or autism; externalising disorders, i.e. oppositional defiant disorder or conduct disorder; or internalising disorders, like anxiety and depression. Substance use and personality disorders, as well as mood and anxiety disorders, are present in adolescent and adult patients with ADHD. Concurrent management is extremely important when treating these patients.[7]

Treatment

Long-term treatment is needed for ADHD as it is a chronic condition. Treatment needs to be adjusted according to the patient's age, stage of development and the side-effects experienced. The two pillars of treatment are medication and different forms of behavioural therapy, or other forms of psychosocial intervention.

Behavioural therapy is a systematic approach that seeks to modify a person's behaviour, making use of the basic principles of behaviour modification and social learning. This is especially effective in managing the complicating behaviour associated with ADHD, and improving the long-term outcome. The principles of behavioural training in young children should be directed at the parents, who should aid the child. This also helps with possible classroom management.[2] Different programmes are available to assist parents to deal with a child who is already in distress with ADHD, with or without co-morbid conditions. The focus should be on a successful transition to adulthood during adolescence. Cognitive behavioural therapy must focus on organisation, interpersonal and planning skills, and abstinence from serious risk behaviour.[8] These are the same areas that need to be addressed in adulthood if impairment and symptoms present or persist.

Several types of medication are available to treat ADHD, including stimulants, atomoxetine, antidepressants and α2-adrenergic agonists. Methylphenidate is the only registered stimulant in South Africa, which is available in different preparations, with different rates of release, i.e. short-, intermediate- and long-acting formulations. Atomoxetine is the only non-stimulant registered for the treatment of ADHD. Both methylphenidate and atomoxetine are generally well tolerated, and most of

the adverse effects are mild or temporary. Both can cause a decreased appetite, insomnia, headaches and abdominal pain, the most common side-effects, even after 24 months.[9]

Psychostimulants are the first-choice pharmacological treatment in children and adults. The advantage of using modified-release methylphenidate in children is that the parents are able to control medication adherence. Also, the medication does not need to be taken at school, lessening stigma. Medication adherence is also better in adults, with a lower risk of medication abuse. Atomoxetine should be the drug of choice if methylphenidate is poorly tolerated in the presence of tics, severe anxiety or a history of previous misuse. Dose titration should be according to the clinical response and side-effects, and treatment should continue for as long as clinically useful.[10]

Adverse events occur, and need to be managed for the safety of patients, but overestimating the risk of side-effects can prevent patients from benefiting from treatment. This has long-term implications for the patient, especially if the widespread effect of ADHD on a patient's life is taken into consideration. Most side-effects in the treatment of ADHD are manageable, and treatment seldom needs to be stopped.[11]

Baseline investigations before the initiation of pharmacotherapy with a stimulant include obtaining a full medical history; weight, height, blood pressure and pulse measurements, and auscultation of the heart; and enquiring about a family history of sudden cardiovascular death, and a personal history of cardiovascular illness or stimulant misuse. Baseline investigations for atomoxetine include obtaining a full medical history; weight, height, blood pressure and pulse measurement, and enquiring about a personal history of liver illness.[10]

Appetite loss is a common side-effect of methylphenidate and atomoxetine, and can sometimes result in a growth delay. The appetite loss is sometimes worsened by nausea, stomach aches and vomiting. On average, the growth delay is 2.5 kg and 2.7 cm in two years, and then attenuates. This is compensated for within two years after stopping treatment. Recommendations to manage this include giving the medication after meals, consuming high-caloric snacks, taking drug "holidays" during weekends and school holidays, and monitoring weight gain and growth at least six monthly, for early referral to an endocrinologist, if needed.[12]

The cardiovascular risk associated with methylphenidate includes a nonsignificant short-term increase in blood pressure (1-4 mmHg) and pulse rate (1-2 beats per minute), but up to 5% of patients can experience an increase above the 95th percentile. Large epidemiological studies have failed to show an association between ADHD medication and severe cardiovascular events, like myocardial infarction, a stroke or sudden cardiovascular death. Routine electrocardiographic monitoring is not recommended. However, the current guidelines recommend that if the blood pressure is above the 95th percentile after three separate readings, a cardiologist should be consulted prior to initiating or continuing treatment because of the very rare risk of sudden death. High-risk patients include those with symptoms of syncope, known structural heart disease and a family history of sudden cardiac death before the age of 40 years. They should be evaluated carefully before the initiation of medication.[3,13,14]

It is difficult to assess whether or not the sleep disturbance commonly reported is due to the medication or to the underlying condition. Therefore, it is essential to obtain a thorough sleep history prior to the initiation of treatment. Sleep hygiene is always the first treatment step. Initial insomnia can be owing to the rebound effect when the medication wears off when patients are treated with methylphenidate. Sometimes adding a short-acting stimulant can resolve the problem. If it is due to the medication (methylphenidate or atomoxetine), the dose can be reduced. There is also evidence for the use of melatonin in these patients.[15]

The presence of tics remains a challenge in any patient, and not treating the co-morbid ADHD may worsen the situation. There is co-morbidity of 20% with ADHD. As Tourette's syndrome is a condition with a waxing and waning pattern, treatment should be given for at least three months before a conclusion can be drawn on the effect on the tics. Specialist treatment is recommended, and atomoxetine is often the medication of choice, even though recent evidence suggests that stimulants are not contraindicated and seldom really worsen the tics.[16]

If mood symptoms or psychotic symptoms present for the first time once a patient has been initiated on a treatment for ADHD, it is recommended that the patient should be referred to a psychiatrist for evaluation of the co-morbid conditions before a rechallenge is attempted.

Clinicians are often asked about the role of the diet, preservatives, supplements and sugar on the symptomology of ADHD. A recent meta-analysis found a small effect only of fatty acid supplementation and the elimination of food colouring from the diet. However, more studies are needed as methodological concerns have been raised regarding blinding and participant selection.[17] The evidence is not conclusive, and more studies are needed before recommendations can be finalised.

Conclusion

ADHD is a complex disorder to treat, but paying attention to the individual with ADHD over his or her lifespan, and offering treatment within a changing system, can help keep these patients to remain focused and to function in their lives at home, school or work, and socially, thereby improving their quality of life.

References

1. American Psychiatry Association. Diagnostic and statistical manual of mental disorders, DSM-5. 5th ed. Washington DC: APA, 2013.
2. Feldman HM, Reiff MI. Attention deficit-hyperactivity disorder in children and adolescents. N Engl J Med. 2014;370(9):838-846.
3. Greydanus DE, Prat HE, Patel DR. Attention deficit hyperactivity disorder across the lifespan: the child, adolescent and adult. Dis Mon. 2007;53(2):70-131.
4. Farone SV, Perlis RH, Doyle RE, et al. Molecular genetics of attention/deficit hyperactivity disorder. Biol Psychiatry. 2005;57(11):1313-1323.
5. Stahl SM. Stahl's essential psychopharmacology: neuroscientific basis and practical applications. Cambridge: Cambridge University Press, 2013.

6. Asherson P, Chen W, Craddock B, Taylor E. Adult attention-deficit hyperactivity disorder: recognition and treatment in general adult psychiatry. Br J Psychiatry. 2007;190:4-5.
7. Giacobini M, Medin E, Ahnemark E, et al. Prevalence, patient characteristics and pharmacological treatment of children, adolescents and adults diagnosed with ADHD in Sweden. J Atten Disord. 2014.
8. Sibley MH, Kuriyan AB, Evans SW, et al. Pharmacological and psychosocial treatments for adolescents with ADHD: an updated systematic review of the literature. Clin Psychol Rev. 2014;34(3):218-232.
9. Clavena A, Bonati M. Safety of medicines used for ADHD in children: a review of published prospective clinical trials. Arch Dis Child. 2014;99(9):866-872.
10. Bolea-Almanac B, Nutt DJ, Adamou M, et al. Evidence-based guidelines for the pharmacological management of attention deficit and hyperactivity disorder: update on the recommendations of the British Association of Psychopharmacology. J Psychopharmacol. 2014;1-25.
11. Cortese S, Holtmann M, Banascheswki T, et al. Practitioner review: current best practice in the management of adverse events during treatment with ADHD medications in children and adolescents. J Child Psychol Psychiatry. 2013;54(3):227-246.
12. Faraone SV, Biederman J, Morley CP, Spencer TJ. Effect of stimulants on height and weight: a review of the literature. J Am Acad Child Adol Psychiatry. 2008;47(9):994-1009.
13. Habel LA, Cooper WO, Sox CM, et al. ADHD medications and risk of serious cardiovascular events in young and middle-aged adults. JAMA. 2011;306(24):2673-2683.
14. Cooper WO, Habel LA, Sox CM, et al. ADHD drugs and serious cardiovascular events in children and young adults. N Eng J Med. 2011;365(20):1896-1904.
15. Konofal E, Lecendreux M, Cortese S. Sleep and ADHD. Sleep Med. 2010;11(7):652-658.
16. Bloch MH, Panza KE, Landeros-Weisenberger A, Leckman JF. Meta-analysis: treatment of attention deficit/ hyperactivity disorder in children with comorbid tic disorders. J Am Acad Child Adolesc Psychiatry. 2009;48(9):884-893.
17. Sonuga-Barke E, Brandeis D, Cotese S, et al.Nonpharmacological interventions for ADHD: systematic review and meta-analysis of randomized controlled trials of dietary and psychosocial treatments. Am J Psychiatry. 2013;170(3):275-289.