Dizziness and Vertigo in the Adolescent

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KEYWORDS

• Vertigo • Dizziness • Adolescence • Brain development
• Episodic ataxia • Migraine • Chronic daily headache • POTS

KEY POINTS

- For those few adolescents who seek outpatient evaluation for these complaints, the majority are diagnosed with migraine headaches.
- In addition to migraine headache, the differential diagnosis in this age group includes episodic ataxia type II; chronic daily headaches; postural orthostatic tachycardia; intracranial mass lesions; psychiatric disorders (eg, depression or somatoform disorders); and rarely vestibular disorders, including viral labyrinthitis and Ménière's disease.
- Evaluation and, in the majority of cases, diagnosis is based on careful history and physical examination with neuroimaging performed for all adolescents with a history of trauma, an abnormal neurologic examination, persistent headaches, or indication of central lesion on vestibular testing.

M.C. is a 16-year-old girl presenting with a complaint of frequent episodes of dizziness that started when she was 13 years of age. The events are characterized by a feeling that she describes as "losing track of her body in space." The events are brief and last only 1 to 2 seconds. There is no associated change in vision, palpitations, or sweating. Although she does have a sensation of falling, she has not fallen. The events occur multiple times per week and are more frequent around the time of her menses or just before the onset of a headache, which she describes as a prolonged, severe throbbing pain with associated nausea and vomiting that resolve with sleep. The dizziness can occur both at rest and with activity and in any position. It is not triggered by head position.

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Her past medical history is otherwise benign. She has not required hospital admission or surgeries. She is not taking any medications. She denies the use of alcohol, tobacco, or illicit drugs; however, she notes that many of her friends have experimented with marijuana. Her review of systems is positive for significant stress regarding grades at school. She is active in several extracurricular activities. She describes much frustration with her parents for not allowing her more freedoms after she was caught attempting to shoplift when she was 13 years old. Her sleep patterns are erratic, and she does not think that she is sleeping well. Her mother has a diagnosis of migraine headaches. There is a maternal aunt who died in her twenties secondary to an astrocytoma and distant paternal cousin who died in his forties of a brain tumor.

Her general and neurologic examination is unremarkable. Because of the patient's and family's anxiety regarding the family history, an MRI of the brain was obtained, which is unremarkable.

Following the appointment, she is started on a low dose of amitriptyline at night, which results in a marked reduction in the frequency of her dizziness and headaches.

THE ADOLESCENT BRAIN

Adolescence, the developmental transition between the dependency of childhood and the independency of adulthood, encompasses the approximate time period between 12 and 18 years of age. Behavior during this developmental stage is frequently characterized by risk taking, impulsivity, and poor choices. The indestructible attitude of the adolescent, which can be met by negative consequences, promotes experimentation of adult practices, development of self-esteem, and eventually social acceptance.[1]

Although the brain reaches 90% of its adult size by 6 years of age, pruning (resulting in decreasing synaptic density) and cortical thinning occur throughout childhood and adolescence. The volume of white matter increases up to about 20 years of age as the result of ongoing myelination of white matter tracts. One of the last regions to undergo both of these maturational processes is the prefrontal cortex, the region of the brain that participates in executive, attention, and regulatory functions.[2]

Adolescence represents a unique time period of brain development marked by changes in both anatomic connectivity and functional activation. Recently, Casey and colleagues[1] suggested that the differential developmental trajectories of the limbic system and subcortical structures (eg, basal ganglia) as compared with the prefrontal cortex could, in part, explain the impulsivity and risk-taking behavior that occur during adolescence. In their model, earlier maturation of the limbic system and subcortical structures during adolescence drives adolescent behavior. As the connections of the prefrontal cortex mature, the influence of the limbic system and subcortical structures is reduced and the prefrontal cortex dominates, resulting in an improved ability to suppress impulses and greater emphasis on goal-driven choices. Their model is supported by recent demonstrations of an exaggerated response of the nucleus accumbens in the adolescent as compared to the adult and child in a task that manipulated reward values[1,3] and the correlation of the development of fiber tracts between the prefrontal cortex and basal ganglia with performance on a go/no-go task, a measure of inhibitory control.[4]

Vertigo represents the inappropriate sense or hallucination of motion and is related to dysfunction of the vestibular system. Although morphologic development of the vestibular system is complete by term gestation,[5] studies of the development of postural balance suggest that functional maturation of the vestibular system is ongoing during childhood and adolescence. (See article by O'Reilly and colleagues