

Dizziness and Orthostatic Intolerance In Pediatric Headache Patients

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Children and adolescents with headaches commonly complain of dizziness that creates significant distress among the patients and their families. Dizziness is largely due to either orthostatic intolerance or vertigo; this distinction is the initial step in the evaluation of a child with co-occurrence of headaches and dizziness. Vertiginous symptoms are most commonly due to vestibular migraine or benign positional vertigo. This review would focus its attention on the diagnosis, evaluation, and management of orthostatic intolerance, specifically postural orthostatic tachycardia syndrome.

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Introduction

Dizziness occurs in 5%-8% of children and up to 60% of children report concurrent headache with their dizziness.^{1,2} Adults with migraine have a 51.7% lifetime prevalence of vertigo or dizziness compared with 31.5% in a healthy control population.³ These symptoms can cause significant distress to the children and their parents. For a primary care provider and pediatric neurologist, accurate diagnosis leads to appropriate treatment and subsequent improvement in quality of life.

The first step of evaluation is determining the nature of the dizziness—is the child having the sensation of lightheadedness or vertigo? Lightheadedness is described as feeling faint, as if the blood is rushing out of one's head, and in extreme cases may result in syncope. Lightheadedness is commonly due to orthostatic dysfunction. Vertigo is the sensation of movement, feeling off-balance, spinning, or tilting. This sensation could be present for the children themselves or the surroundings. Vertigo is a common sign of vestibular dysfunction. In children, it is important to determine if vertigo is from a balance issue due to ataxia or cerebellar dysfunction.

Herein, we would focus on orthostatic intolerance (OI) and syncope, in addition to providing a review of migraine syndromes that have dizziness or vertigo as a predominant

feature (Table 1). We would review postural orthostatic tachycardia syndrome (POTS), a common comorbidity of the migraineur as well as therapeutic strategies for managing OI.

OI and Basic Physiology of Orthostasis

Orthostasis is maintenance of upright, standing posture. Orthostatic hypotension is defined as a systolic blood pressure decrease of ≥ 20 mm Hg or diastolic blood pressure decline of ≥ 10 mm Hg within 3 minutes of standing or with tilt-table testing to 60° .⁴ Migraineurs have been shown to be at increased risk of OI, a transient range of symptoms including lightheadedness, headache, fatigue, abdominal pain, and syncope, which arise from upright posture.⁵ OI in turn may exacerbate migraine symptoms.

With upright posture in adults, approximately 300-800 mL of blood shifts down to the heart, there is increase in the interstitial fluid volume, there is a reduction in venous return to the heart, and thus decreased cardiac output. The volume shift in pediatrics is not well established. The resulting blood pressure decline is exaggerated by deconditioning, inadequate hydration, excessively warm environmental temperature, female sex, and sustained recumbency.⁴ In these situations, presumably, the fluid shifts are equal but the blood pool is reduced. Baroreceptors in the vessel walls produce an increased sympathetic response and decreased vagal activity. This results in increased heart rate (HR) and peripheral vasoconstriction, which causes elevation of the blood pressure. Skeletal muscle contraction in the lower

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Table 1 Diagnoses to Consider in a Child With Dizzy Headache

Primarily dizzy or lightheadedness or syncope
 Neurally mediated hypotension
 Postural orthostatic tachycardia syndrome
 Orthostatic hypotension
 Chronic subjective dizziness

Primarily vertigo
 Vestibular migraine
 Migraine with brainstem aura
 Benign positional vertigo
 Central nervous system lesion

extremities reduces venous pooling and increases blood to the heart.⁴

Neurally Mediated Hypotension

Neurally mediated hypotension (NMH) is the most common cause of syncope. It is also referred to as neurally mediated syncope, vasovagal syncope, vasodepressor syncope, reflex syncope, and neurocardiogenic syncope. Syncope is a transient loss of consciousness and tone resulting from holocephalic hypoperfusion followed by spontaneous, full recovery NMH. This typically occurs while in standing position (postural NMH) and is associated with reductions in HR or blood pressure or both. It is defined as a 25 mm Hg decrease in systolic blood pressure with standing or tilt-table testing, without an increase in HR and is associated with symptoms of OI including cognitive slowing, pallor, diaphoresis, lightheadedness, blurry vision, fatigue, abdominal pain, and headache.⁵ This is felt to be related to inadequate autonomic function with increased parasympathetic and reduced sympathetic drive.⁴ This results in decreased HR, peripheral vasodilation, and inadequate cerebral perfusion. Few patients have NMH resulting from an emotional activation (central NMH) such as anxiety, stress, sight of blood, or pain, even though this is perhaps the scenario most commonly portrayed in movies. Central NMH presumably leads to the same exaggerated increased parasympathetic and reduced sympathetic drive.

Postural Orthostatic Tachycardia Syndrome

Definition

POTS is a heterogenous syndrome involving systemic symptoms resulting from autonomic dysregulation with orthostasis. The most common symptoms in patients with POTS include dizziness (84%-95%), weakness (72%-94%), and orthostatic syncope (62.7%); other common symptoms are palpitations, nausea, fatigue, exercise intolerance, headaches, poor sleep quality with daytime sleepiness, abdominal pain, and edema.⁶⁻⁸ A study of 37 adolescents with

POTS found all patients to have tension headache or migraine, and 89% reported orthostatic headache.⁹ A prospective study of 24 adults with POTS found 58% (14 of 24) suffered from orthostatic headaches. Overall, 15 of the 24 patients developed headache during tilt-table testing, and most of these headaches improved with recumbency.¹⁰ Common triggers include hot environmental temperatures (79%), meals (42%), and emotional stimulus (30%).^{6,7} POTS is more commonly diagnosed in women aged 15-50 years. In total, 80% of adults with POTS and 65%-70% of adolescents diagnosed with the disorder are women.

Diagnosis

In adults, the diagnosis of POTS is based on commonly accepted parameters like greater than 30 beats per minute (bpm) increase in HR or an absolute HR over 120 bpm during passive upright tilt, or active standing over 10 minutes. Tilt-table testing usually consists of 5 minutes in the supine position, then a passive tilt to 60°-70° and interval assessment greater than 10 minutes. Performing tilt-table testing on all patients with suspected POTS can be challenging, and assessing for POTS in clinic can be accomplished easily with HR and blood pressure measurement after 5 minutes in lying down position and 10 minutes in standing position. False-positive tilt-table and active standing testing can occur with acute blood loss, hyperadrenergic state, diuretic use, anxiety, anticholinergic (eg, tricyclic antidepressants) or vasodilating medications, and dehydration.

In pediatrics, there is no consensus for HR parameters in the diagnosis of POTS. Table 2 summarizes orthostatic data of healthy pediatric controls and normative school age children populations. These studies show normative ranges that overlap with the accepted adult criteria for POTS. Therefore, several authors recommend using increases in HR of 35 or 40 bpm in adolescents, as it is more sensitive than 30 bpm.¹¹⁻¹³ There are no recommendations for vital sign parameters for diagnosis for children less than 12 years of age. To improve specificity of POTS diagnosis, it should not rely solely on changes in HR with tilt-table testing or active standing. Individuals should also have the following symptoms of chronic OI: headache, nausea, dizziness and lightheadedness, near faint, blurred vision, weakness in legs, poor concentration, and blackout or whiteout of vision.¹⁴

Evaluation

The physical examination should include an active standing test. Symptoms of OI and a positive active standing test are usually sufficient to make the diagnosis. Tilt-table testing can be reserved for individuals without classic symptoms or atypical presentation. Basic initial workup includes complete blood count to rule out anemia, ferritin, vitamin D, electrolyte panel, thyroid function testing, and an electrocardiogram or Holter monitor to investigate the presence of cardiac conduction abnormalities.^{15,16}

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