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Original Article

Evaluation and management of vestibular migraine in children: Experience from a pediatric vestibular clinic

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ABSTRACT

Objective: Epidemiologic studies have shown Vestibular migraine (VM) to be the most common cause of vertigo in children, but little is known about the typical presentation and response to treatment of this disorder in the pediatric population. The aim of this study was to evaluate the diagnostic features and response to therapy of VM in children managed at a pediatric vestibular clinic.

Methods: Twenty-eight patients ≤18 years old with a diagnosis of VM were identified from 208 patients seen at the Balance and Vestibular Program at Boston Children's Hospital from July 2012–July 2014, after excluding 12 patients with a history of major otologic or neurologic surgery, recent concussion, or additional vestibular disorders. Patients' electronic medical records and testing results were retrospectively reviewed.

Results: Patients ranged in age from 9 to 18 years old (mean 14.48). All included patients met criteria for definite (n = 25) or probable (n = 3) VM as defined by the International Classification of Headache Disorders. Rotary chair (n = 17), caloric (n = 8), cervical vestibular evoked myogenic potential (n = 16), and video head impulse (n = 3) tests were normal. Medications effectively reduced reported vestibular symptoms in 88% of those treated with tricyclics (n = 8), 86% of those treated with cyprohepatadine (n = 7), 80% of those treated with topiramate (n = 5), 80% of those treated with triptans (n = 10), and 25% of those treated with gabapentin (n = 4).

Conclusions: Vestibular migraine is a common cause of vertigo in the pediatric population that is frequently responsive to medical therapy.

1. Introduction

An association between vestibular symptoms and migraine was first described in adults by Kayan and Hood in 1984.[1] Vestibular migraine (VM) has quickly become widely recognized as the most common cause of vertigo in adults since Neuhauser and Lempert formally described its diagnostic criteria in 2001,[2] and numerous studies have been published

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on its diagnosis, treatment, and proposed mechanisms in adults.[1–26]

The relationship between vertigo and migraine was first recognized in children with Basser's initial description of benign paroxysmal vertigo of childhood (BPVC) in 1964.[27] The International Classification of Headache Disorders (ICHD) lists BPVC as a migraine-precursor childhood periodic syndrome, and the diagnosis requires >4 recurrent episodes of severe vertigo lasting minutes to hours, a normal interictal vestibular examination and electroencephalogram, and the elimination of other possible causes.[28] The prevalence of adult migraine is twice as common in people with a history of BPVC.[29] Adult migraineurs are also three times as likely to have a history of BPVC as those without migraine, and half of BPVC patients have a family history of migraine.

Epidemiologic studies of pediatric vertigo consistently cite migraine as the most common cause (24–56%),[30–36] though most of these studies do not differentiate between BPVC and VM. The diagnostic criteria for "definite" VM (Fig. 1) outlined in the 3rd Edition of the ICHD, which were based on the consensus document of the Bárány Society and the Migraine Classification Subcommittee of the International Headache Society,[37] require that the patient meet ICHD criteria for migraine and that migrainous features (migraine headache, photophobia, phonophobia, or visual aura) occur with at least half of the episodes.[28] In contrast, BPVC episodes are typically purely vertiginous, without migrainous symptoms. BPVC also typically resolves by the age of six,[29] while VM can occur at any age. Many studies have described the presentation and natural history of BPVC,[29,38–47] but descriptions of the presentation and natural history of VM in pediatric patients are limited,[48] and the response of pediatric VM to treatment is yet to be described.

The goal of this study was to retrospectively review the clinical features of VM and its response to treatment in patients seen at our pediatric vestibular clinic.

2. Materials and methods

We retrospectively reviewed our internal database of 208 patients seen at the Balance and Vestibular Program Clinic at Boston Children's Hospital from July 2012 to July 2014 to identify all patients ≤18 years of age that were diagnosed with VM, based on diagnostic criteria from the ICHD (Fig. 1).[28] Patients with a history of brain or ear surgery, concussion, or an additional vestibular disorder were excluded. The electronic medical records of the remaining 28 patients were reviewed to determine clinical presentation, diagnostic test results, and treatment responses. This data was incorporated into a RedCap database[49] in a deidentified fashion for qualitative analysis. This retrospective study was approved by the Institutional Review Board of Boston Children's Hospital.

Symptom features were primarily determined by responses to a standard symptom questionnaire given to all patients at our vestibular clinic. For subjects with long-standing vertigo or headache symptoms, only specific symptoms occurring over the year prior to the initial clinic evaluation were specifically described in this study. All patients underwent a complete otological and neurological examination by a pediatric otolaryngologist (JRB).

Twenty patients completed a variable combination of objective vestibular and balance tests. All testing was conducted in our vestibular laboratory at the Balance and Vestibular Program at Boston Children's Hospital by a licensed audiologist (GWZ), with the support of a trained assistant. Rotary chair, videonystagmography (VNG), and caloric tests were performed using Micromedical equipment (System 2000 and VisualEyes with AquaStim; Micromedical Technologies, Chatham, Illinois). VNG and caloric testing are considered separate tests in our lab and are therefore described separately in this study. Video head impulse testing (VHIT) was performed using the ICS Impulse system (GN Otometrics, Denmark). Computerized dynamic posturography (CDP) was conducted with NeuroCom SMART EquiTest, and cervical vestibular evoked myogenic potential testing (cVEMP) was recorded with Bio-logic Navigator Pro Evoked Potential system (Natus Medical Inc, San Carlos, California). Balance and vestibular testing results were compared to manufacturer-supplied age-specific norms, with the exception of cVEMP and VHIT, which were compared to normative data established in our previous studies.[50,51]

Medication response was described by symptom change (none, improved, or resolved) reported by individual patients with use of each respective medication, as documented in the electronic medical record at their subsequent follow-up appointments in our vestibular clinic. Patients' responses to medications prescribed for VM treatment prior to their initial evaluation at our vestibular clinic were also evaluated, as documented in the electronic medical record. In our vestibular clinic abortive medications are prescribed for patients with <3 VM episodes per month, and prophylactic medications are prescribed for patients with more frequent episodes. Sumatriptan is typically our first-line abortive medication and amitriptyline is typically our first line prophylactic medication.

3. Results

3.1. *Clinical presentation*

Forty out of 208 patients were diagnosed with VM (19.2%). Twenty-eight patients were included in the final analysis, after excluding 12 based on the criteria outlined above. Demographics are outlined in Table 1. The male to female ratio was 1:1.3. Dizziness and headache symptoms started at mean ages of 8.29 ± 3.71 years (range 3–16) and 9.00 ± 4.37 years (range 3–17), respectively. Symptom features and triggers are outlined in Table 2. All patients described true rotatory vertigo, with 75% also describing a sensation of swaying, rocking, and/or tilting. Headaches were frontal in 46% (n = 13), temporal in 25% (n = 7), occipital in 14% (n = 4), vertex in 25% (n = 7), and retro-orbital in 4% (n = 1) of patients, and were unilateral in 39% (n = 11), pulsating in 32% (n = 9), and both in 7% (n = 2) of patients. Patients underwent routine follow-up evaluations in the office at variable frequencies for a mean duration of 14.5 months ± 8.5 months (range 1–24).