Migraine Associated Vertigo: A Common but Difficult-to-Define Disorder

A specialist reviews the clinical features and differential diagnosis of this potentially under-recognized phenomenon.

By Terry D. Fife, MD

Migraine associated vertigo (MAV) is a common and probably under-recognized cause of episodic vertigo. Migraine associated vertigo has been the subject of a number of recent papers but is not new. Edward Liveing noted that among migraineurs, it was “no uncommon thing to find the most intense feeling of giddiness” and “great nausea increased by every attempt to rise or move...not unlike the first stage of seasickness.” MAV, which may be referred to by other terms such as vestibular migraine, migraine associated dizziness, migraine associated recurrent vertigo, benign recurrent vertigo, migraine-related vestibulopathy, migrainous vertigo, is a common cause of recurrent vertigo affecting about a third of all migraineurs. Patients with migraine headaches are three times as likely to have vertigo when compared to patients with tension type headaches. Meanwhile, migraine is more prevalent among patients with recurrent vertigo. The co-occurrence of vertigo and migraine in a population-based study was 3.2 percent, which is three times that expected by chance. The lifetime prevalence of MAV is one percent and often results in a negative impact on quality of life and substantial utilization of medical resources.

Terminology & Definitions

The International Headache Society’s International Classification of Headache Disorders, Edition 2 (ICHD-2) does not include vestibular migraine or migraine associated vertigo in its classification, per se. That does not mean its panel discounts the syndrome but the Classification is a work in progress achieved by consensus of many headache experts. At present, ICHD-2 Classification accounts for dizziness in migraine as “Basilar-type migraine” though it is slightly different from Bickerstaff’s original conceptions (Table 1). Nevertheless, using these criteria, a minority of patients with probable migraine associated vertigo meet the strict criteria for basilar type migraine.

The existence of basilar-type migraine as a distinct disorder has come in to question. In a study of patients with migraine with aura or its subtype of basilar type migraine recruited from 105 families, basilar migraine accounted for 10 percent. Vertigo was the most common symptom (61 percent) and no genetic, clinical or epidemiological differences dis-
Distinguished these patients from other migraine with aura patients including those with hemiplegic migraine.

Wang and colleagues in a recent study of 77 patients found the only difference between basilar type migraine and definite or probable MAV was that basilar type migraine patients had more severe vertigo and more neurological symptoms. The authors concluded that basilar type migraine is likely at the more severe end of a spectrum of MAV. By analogy, cough, fever and chest pain are associated with pneumonia and yet some patients may lack one or even all of these features and yet have pneumonia. Likewise migraine may result in headache, vertigo, visual phenomena and many other symptoms together or in isolation. Despite an imperfect scheme of classification for vertigo associated with migraine, its proper recognition and treatment should be a goal of all clinicians treating patients with dizziness.

### Diagnosis and Clinical Features of MAV

MAV is a clinical diagnosis made by the combination of exclusion of other causes and by the presence of some features somewhat characteristic of MAV (Table 3). The exclusion of other disorders that may produce a similar pattern of dizziness is achieved in part by the neurological examination but may include brain MRI, CT temporal bone, vestibular testing, audiological testing and other techniques, depending on the patient’s history.

Perhaps the most common misperception of migraine associated vertigo is that the vertigo is an aura that is brief and precedes or is contemporaneous with a migraine headache. In numerous studies, however, vertigo is frequently (30-70 percent) independent of headache and is distinct from an aura. Description of vertigo. Most primary vestibular disorders such as benign positional vertigo, vestibular neuritis and Meniere’s disease have a fairly stereotypical temporal profile of vertigo and the majority of patients with these conditions describe their dizziness as a spinning sensation. MAV, however, is more likely to manifest with some variations in the symptom description. Spinning is the most common but to and fro oscillations, rocking and floating or simply motion sickness with nausea are quite common. Indeed, it is common for patients to describe chronic rocking dizziness coupled with periodic episodes of spinning as well. Table 4 outlines some of the clinical features of MAV observed in one report.

### Table 1. International Classification of Headache Disorders (ICHD-2)

<table>
<thead>
<tr>
<th>Migraine (ICHD-2.1)</th>
<th>a neurological syndrome characterized by altered bodily experiences, painful headaches, and nausea that is more common in women than in men.</th>
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<tr>
<td>Migraine with aura (ICHD-2.1.2)</td>
<td>a recurrent disorder manifesting in attacks of reversible focal neurological symptoms that usually develop gradually over 5-20 minutes and last for less than 60 minutes. Headache with the features of migraine without aura usually follows the aura symptoms. Less commonly, headache lacks migrainous features or is completely absent.</td>
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<td>Basilar-type migraine (ICHD-2 1.2.6)</td>
<td>Migraine with aura symptoms clearly originating from the brainstem and/or from both hemispheres simultaneously affected, but no motor weakness.</td>
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International Classification of Headache Disorders (ICHD-2) (Source: http://ihs-classification.org/en/02_klassifikation/)

**Definition of terms not included in ICHD-2:**

- **Vestibular migraine** – a migraine variant that manifests with predominantly vestibular symptoms.
- **Migraine associated vertigo or dizziness** – any kind of vertigo or dizziness related to migraine.
- **Migrainous vertigo** – vertigo that is related to or part of migraine.

Based on the frequency of isolated vertigo, MAV can be considered as another manifestation of migraine rather than simply a part of the headache aura. By analogy, cough, fever and chest pain are associated with pneumonia and yet some patients may lack one or even all of these features and yet have pneumonia. Likewise migraine may result in headache, vertigo, visual phenomena and many other symptoms together or in isolation. Despite an imperfect scheme of classification for vertigo associated with migraine, its proper recognition and treatment should be a goal of all clinicians treating patients with dizziness.

**Table 2 outlines current diagnostic criteria for basilar type migraine, definite and probable migraine associated vertigo. In contrast to recurrent vertigo related to migraine in adults, it is now widely recognized that benign paroxysmal vertigo of childhood is a vertiginous manifestation of migraine unaccompanied by headache[27] and is so recognized in ICHD-2. Many of these patients develop typical migraine headaches later on in life.”**

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Duration and frequency of episodes of vertigo. The duration of the periods of vertigo in MAV is variable as exemplified by Table 4. Some patients reported fragmentary vertigo (sometimes referred to as “quick spins”) lasting only a second or so. Background sensations of a low grade rocking, movement-related disequilibrium and motion sickness lasting days to weeks have been reported as well. Motion sickness is also common in migraineurs, occurring in nearly half of patients. Clinical examination. Most patients with MAV exhibit a normal neurological examination but may show unsteadiness on Romberg testing. Sometimes patients will appear uncomfortable in bright light or when looking at a moving optokinetic strip or when repeatedly changing their direction of gaze. Despite the normality of the objective findings, some patients are remarkably hampered by their symptoms and the associated nausea.

Vestibular laboratory testing. Vestibular loss or positional nystagmus have been reported in some studies on video or electronystagmography. Cass and colleagues found 18 percent of those with migraine associated dizziness had unilateral vestibular hypofunction and four percent had bilateral vestibular hypofunction, though a cause and effect relationship was not established in that study. In general, aside from minor static positional nystagmus, vestibular testing by caloric or rotational chair studies is normal in most patients with MAV.

Differential Diagnosis
As already mentioned, vertigo episodes in MAV may vary in duration and there is no definitive diagnostic test. Considering the differential diagnosis is therefore particularly important in assuring proper assignment of cause.

Meniere’s disease. MAV is about five times more common than Meniere’s disease and the two conditions occur together more than expected. Among people with Meniere’s disease, 56 percent also have migraine headaches which is more than twice than seen in the general population. In addition, 45 percent of Meniere’s patients have at least one migraine symptom (migrainous headache, photophobia, aura symptoms) with Ménière attacks. Some patients with MAV experience randomly occurring vertigo lasting one to six hours in a pattern much like that seen in Meniere’s. During spells of MAV, the vertigo may lead to nausea but if the patient is completely prostrate with recurrent vomiting, it somewhat favors Meniere’s. Patients with MAV are also afflicted by nausea and movement intolerance but generally of a lesser severity. The best way to distinguish MAV from Meniere’s is by
the presence of unilateral muffled hearing, tinnitus and fluctuating hearing all on the same side.

Audiometry is generally normal in MAV but can show fluctuating and eventual permanent low frequency sensorineural hearing loss in Meniere’s. Vestibular loss by caloric testing on the affected side also strongly favors Meniere’s disease over MAV. Early in the course of Meniere’s, hearing and vestibular function may still be normal, making it more challenging to separate these two conditions that are not mutually exclusive.

Benign paroxysmal positional vertigo (BPPV). It has been reported that patients with migraine are more likely to also have benign paroxysmal positional vertigo (BPPV) and that patients with BPPV are more likely to have migraine than those in the general population. BPPV is evoked by Dix Hallpike positioning and associated with characteristic nystagmus and responds to canalith repositioning treatment so is generally easy to distinguish from MAV. Nevertheless, MAV can sometimes produce vertigo with positional elements that may mimic benign positional vertigo.

The positional dizziness of MAV may be associated with low velocity static positional nystagmus and unlike BPPV the vertigo may build up or evolve over a period of 30 seconds to several minutes. Some patients with migraine positional vertigo may find that they cannot lie in certain positions because they develop nausea and dizziness within minutes.

Vestibular neuritis. Vestibular neuritis is an inflammatory disorder of the vestibular nerve that causes acute loss of vestibular function on one side. Clinically, this leads to a single spontaneous attack of spinning vertigo with nausea with nystagmus beating away from the affected side. Recovery takes usually several weeks and in most cases the signs of unilateral vestibular loss are evident. MAV may cause a single attack of vertigo but recovery is usually faster, often within a day or so and there are no signs of unilateral vestibular dysfunction. MAV manifesting in this manner is also much more likely to recur, whereas vestibular neuritis recurs in only about two percent.

Panic disorder and anxiety-related dizziness. The dizziness that occurs with panic disorder may occur independent or during panic attacks. Anxiety or panic disorder may cause sensations of rocking or floating or “internal spinning.” The dizziness is often prolonged, lasting days or even continuously but unlike MAV, it is not particularly aggravated by head motion and nausea is minimal or absent. Some patients describe feeling overwhelmed by too much sensory input as might occur in noisy environments or when exposed to stress and visual commotion. This condition has been referred to as “sensory overload.” Of all the syndromes most likely to get mixed up with MAV, anxiety-related dizziness is the most challenging. This is partly due to the overlapping symptoms but also due to the substantial anxiety comorbidity seen among patients with chronic vertigo and migraine.

Transient ischemic attacks (TIA) or stroke. Recurrent isolated vertigo, usually lasting minutes,
can occur with transient ischemic attacks and must be distinguished from MAV. MAV is more likely to manifest with multiple recurrent vertigo spells over many months or years. When TIA and stroke are considered, appropriate cerebrovascular and brain imaging studies and metabolic and cardiac studies should be done to exclude vascular causes before diagnosing MAV.

Pathophysiology of Vertigo in Migraine

Migraine is an episodic CNS disorder but growing evidence suggests there may be altered neurophysiology even between migraine events. It is possible that all humans have the hard-wired neurocircuitry capable of resulting in migraine symptoms. What may distinguish between those with migraine symptoms and those without them is the inborn threshold for developing symptoms and, to a lesser degree, our exposure to environmental stimuli that activate the cascade of neurobiological processes that leads to the condition we call migraine.

The innate threshold may be affected by inherited factors that likely also influence the propensity for a given individual to manifest one or another type of migraine symptoms. Neuronal responses of the vestibular nuclei are determined not only by their labyrinthine inputs but also by their intrinsic ion channel activity. Since some vestibular neurons mediate gaze stabilization for both VOR and optokinetic stimuli, some patients may be bothered not only by head motion but also by observing objects in motion (optokinetic motion sickness, also called visual vertigo).

Strong evidence supports hypersensitization of brainstem nuclear complexes (trigeminal nucleus caudalis, locus ceruleus, dorsal raphe nucleus) in migraine leading to increased “signal gain.” The trigeminal nucleus caudalis and raphe nuclei may participate in pain hypersensitivity and allodynia. Similarly, vestibular hypersensitization may also occur, perhaps in the vestibular nuclei, leading to oscillating vestibular signals creating fluctuating vestibular asymmetry and hence vertigo, optokinetic motion sickness and general motion intolerance. Migrainous vertigo is caused by central and perhaps also peripheral vestibular mechanisms through release of calcitonin gene-related peptides, catecholamines and excitatory amino acids. Spreading depression affecting the vestibular cortex seems insufficient to adequately explain MAV though this is one of many possible mechanisms.

We do not know how dizziness is related to the migraine process. However, it is possible that fluctuating vestibular asymmetry, either the central or peripheral vestibular level, due to neurotransmitter and ion channel effects. Whenever there is acute

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<th>Table 4. Selected Clinical Features of 33 Patients with MAV</th>
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<td>Other Vestibular Symptoms</td>
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<td>ICHD-2 Headaches</td>
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vestibular asymmetry, vertigo is felt by the patient. The degree of relative asymmetry can influence whether there is violent spinning (a large acute asymmetry) or mild floating or rocking (a minor or oscillating asymmetry). Head movement accentuates vertigo in the presence of acute vestibular asymmetry. Fluctuating degrees of vestibular asymmetry could explain the general motion intolerance in MAV.

Migraine is also associated with innate motion sickness tendencies for reasons still unclear. In addition, many patients with recurrent vertigo develop reactive anxiety that may contribute to the dizziness and confuse the history making it difficult to tell if the dizziness originated with anxiety or results from it.

Finally, chronic or intermittent optokinetic motion sickness, a form of dizziness caused by observation of repetitive motion of objects in the visual surround, may occur with MAV. Retinal signals during optokinetic stimulation travel to the pretectum and nucleus of the optic tract (NOT), descend lateral to the MLF through the reticular substance of the pontine tegmentum (NRTP) to the vestibular nuclei and this pathway may become hyper-activated in migraine.

Treatment
Migraine associated vertigo may respond to many of the same medications used to treat migraine headache but there is very limited data on the treatment of this manifestation of migraine. Flunarazine, a calcium channel antagonist not available in the United States, has been used with some success in the treatment migraine and vertigo and also in prevention of motion sickness. Zolmitriptan was studied in 10 patients with 17 separate vertigo attacks but was not found to be effective. Propranolol was used successfully in several cases of basilar artery migraine with vertigo described by Harker and Rassekh and metoprolol in another. Acetazolamide, a carbonic anhydrase inhibitor, has been anecdotally reported as helpful in familial migraine with vertigo. Another small case series of “grocery store aisle syndrome” consisting of patients most likely afflicted by migraineous vertigo, reported that six of seven patients improved with acetazolamide.

A retrospective study of lamotrigine in the treatment of 19 patients with migraine associated vertigo found that 18 of 19 reported at least 50 percent decline in vertigo frequency; on average, spells diminished from 18 per month to five per month. Tricyclic antidepressants combined with dietary changes was associated with greater than 75 percent improvement in vertigo attack frequency in 24 of 31 patients so treated in one study.

A comprehensive review of migraine-related dizziness and vertigo by Johnson reported that about two-thirds of 79 patients reached “optimal control” of vertigo on a single medication, most commonly a benzodiazepine. Due to the nearly universal (90 percent) use of benzodiazepines in that cohort, the effect of any other treatment is difficult to discern.

An open-label study from Argentina found benefit in reducing dizziness in 10 patients treated with topiramate for migrainous vertigo. A recent double blinded study using topiramate in 14 children ages six-18 years of age with basilar type migraine found a 74 percent (25 mg dose group) and 83 percent (100-mg dose group) reduction in dizziness, vertigo, and ataxia. Headache frequency was also significantly reduced in both dose groups.

Selected patients may benefit from vestibular rehabilitative physical therapy. Nevertheless, most patients with MAV develop nausea and increased dizziness that does not improve satisfactorily over time leading them to quit or ask to stop the therapy. Vestibular physical therapy is most helpful in those with gait difficulty disproportionate to their examination findings.

In short, there are very little scientific data to guide clinicians in the treatment of MAV. Migraine prophylactic medications effective for migraine headaches seem to be equally effective for MAV even when headache is not prominent.

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20. Fife TD, Baloh RW, Duckwiler G 1993 [XXX].