



PRACTICE

EASILY MISSED

Vestibular migraine

Vivien Li *neurology specialty registrar*¹, Helen McArdle *general practitioner*², S Anand Trip *consultant neurologist and honorary associate professor*^{1 3}

¹National Hospital for Neurology and Neurosurgery, UCLH NHS Foundation Trust, London, UK; ²Portree Medical Centre, Isle of Skye, Scotland, UK; ³Department of Neurology, Northwick Park Hospital, LNWUH NHS Trust, Harrow, UK

What you need to know

- Consider vestibular migraine in patients with a history of migraine who experience episodic vestibular symptoms and migrainous features, with or without concurrent headache
- A history of motion sickness or sensitivity can be a helpful diagnostic clue; in contrast, central neurological signs, significant gait ataxia, prominent auditory symptoms, and provocation by particular head movements point to other diagnoses
- Vestibular migraine adversely affects quality of life and increases the risk of falls. Early diagnosis and treatment with migraine prophylactic agents leads to better clinical outcomes

A 63 year old woman presented to her general practitioner with episodes of severe dizziness, nausea, and vomiting associated with photophobia. On the first attack, symptoms were so severe she was admitted to hospital and underwent neuroimaging to exclude a stroke. Following recurrent episodes, she was given various diagnoses including benign paroxysmal positional vertigo and Ménière's disease. She had a history of occasional episodic migraine but did not experience episodes of headache with dizziness. Eventually, a diagnosis of vestibular migraine was reached. After commencing topiramate, she has experienced no further attacks.

What is vestibular migraine?

Vestibular migraine (also known as migrainous vertigo) is considered a migraine variant, characterised by a combination of vertigo, dizziness, or balance disturbance with migrainous features.

It is a relatively newly defined entity. In 2012, the Barany Society and International Headache Society released a consensus document on the diagnostic criteria, which has recently been included in the third edition of the International Classification of Headache Disorders (ICHD-3) (box 1). It is currently listed as an appendix, indicating the need for further validation with

high level evidence, which may lead to its formal acceptance in future revisions.¹ Despite this, we believe it is an important condition to be aware of and recognise, due to its high prevalence (see box 2) and the availability of effective treatments.

Box 1: International Classification of Headache Disorders, third edition (ICHD-3) diagnostic criteria for vestibular migraine¹

- A. At least five episodes fulfilling criteria C and D
- B. A current or past history of migraine with or without aura
- C. Vestibular symptoms* of moderate or severe intensity, lasting between 5 minutes and 72 hours
- D. At least half of episodes are associated with at least one of the following three migrainous features:
 1. Headache with at least two of the following four characteristics:
 - a. Unilateral location
 - b. Pulsating quality
 - c. Moderate or severe intensity
 - d. Aggravation by routine physical activity
 2. Photophobia and phonophobia
 3. Visual aura
- E. Not better accounted for by another ICHD-3 diagnosis or by another vestibular disorder

*Vestibular symptoms may be spontaneous (internal sensation of self motion or movement of external surrounds), postural after head position change, visually induced by moving stimulus, or induced by head motion.

Correspondence to: S A Trip anand.trip@nhs.net

This is one of a series of occasional articles highlighting conditions that may be more common than many doctors realise or may be missed at first presentation. The series advisers are Anthony Harnden, professor of primary care, Department of Primary Care Health Sciences, University of Oxford, and Dr Kevin Barraclough, School of Social and Community Medicine, University of Bristol. To suggest a topic for this series, please email us at practice@bmj.com. You can read more about how to prepare and submit an Education article on our Instructions for Authors pages: <https://www.bmj.com/about-bmj/resources-authors/article-types>

Box 2: How common is vestibular migraine?

- Vestibular migraine has an estimated one year prevalence of 0.9%, based on a cross-sectional study of almost 5000 participants on the epidemiology of dizziness and vertigo in the 2003 German National Telephone Health Interview Survey. This comprised open-ended and standardised questions, with items designed to differentiate between vestibular vertigo and non-vestibular dizziness, followed by those on symptoms relating to four specific conditions including vestibular migraine. Median age at onset was 23 years. Vestibular migraine accounted for 14% of total participants with vestibular symptoms.²
- A cross-sectional study based on the US Annual National Health Interview Survey of over 20 000 respondents found prevalence of vestibular migraine was 2.7%, with 75.8% of those affected being female and mean age of 40.9 years. This would make vestibular migraine the most common cause of episodic dizziness in the US, higher than the estimated one year prevalence of 1.6% for benign paroxysmal positional vertigo and 0.2-0.5% for Ménière's disease, the next two commonest causes.³
- Among 403 migraine patients in a Chinese headache outpatient clinic, 67 (16.6%) were diagnosed with vestibular migraine according to ICHD-3 criteria.⁴
- Based on total number of patients registered at a general practice and number in the workforce, a general practitioner in England would be expected to have an average of about 12 patients with vestibular migraine.⁵

Vestibular migraine is more than the co-occurrence of migraine and vertigo. Rather, consider vestibular migraine when there are:

- Recurrent vestibular symptoms
- A history of migraine
- Temporal association between vestibular and migrainous symptoms in some attacks
- Exclusion of other causes.

There is overlap between areas affected by migraine and the vestibular pathway, supporting the view that vestibular migraine is a migraine variant with vestibular symptoms. How patients with vestibular migraine differ from patients with migraine and only headache is unclear. The exact pathophysiology is incompletely understood but could include neuroanatomical pathways to and from central vestibular structures and neurochemical modulation via the locus coeruleus and raphe nuclei.⁶

Why is it missed?

In the population-based, cross-sectional German National Telephone Health Interview Survey, two thirds of patients with vestibular migraine had consulted a doctor (usually a general practitioner) about it, and almost all of these had undergone at least one investigation. While most patients received a diagnosis, this was vestibular migraine in only 21%, with others diagnoses including anaemia, diabetes, cervical dizziness, psychosomatic symptoms, and hypovolaemia.² Although formal international criteria were agreed only in 2012, the link between vertigo and migraine had long been observed epidemiologically. In 2001 Neuhauser et al proposed operational clinical criteria upon which this study was based.⁷ These are similar to the current ICHD-3 criteria, which were modelled on the International Headache Society classification on migraine. In the US National Health Interview Survey, 54.5% of vestibular migraine patients had seen a community health professional, while 12.7% had presented to an emergency department. Only 10% of those given a diagnosis were told migraine was the cause.³

Headache is not necessarily present at the time of vestibular symptoms,⁸ with migraine onset preceding vestibular symptoms in 74% of patients in one study.² Variability in accompanying symptoms and duration of attacks and overlap of symptoms with other causes of episodic vertigo makes vestibular migraine

difficult to recognise. Although not in the ICHD-3 criteria, mild auditory symptoms including tinnitus and hearing loss can occur in some patients, leading to a misdiagnosis of Ménière's disease.⁹ Normal neurological examination (especially while asymptomatic) and neuroimaging make confirming the diagnosis more challenging, and consequently symptoms may often mistakenly be considered psychogenic.

Why does it matter?

Patients with vestibular migraine have lower health-related quality of life compared with the general population: 40-60% had missed work or school due to symptoms; 34-46% rated overall impact on daily activities as moderate (interrupted task), and 33% rated the impact as severe (abandoned task); 52% had experienced falls in the preceding five years; and there was high rate of healthcare utilisation (23% had visited a hospital or emergency department for symptoms).^{2,3}

When patients are misdiagnosed, vestibular suppressants are commonly prescribed symptomatically, delaying institution of migraine-specific treatments. As with other forms of migraine, earlier correct diagnosis with explanation of symptoms and prophylactic treatment lead to quicker improvement.¹⁰ In one study of 101 vestibular migraine patients from a headache outpatient clinic, 83% had used vestibular suppressants but these were effective in only 12.9%. In comparison, 86% of patients who took migraine prophylaxis had >50% reduction in vestibular symptoms after two months.¹¹

Anxiety and depression are significantly associated with vestibular migraine,³ and lack of timely diagnosis not only adds to the psychological burden of the condition but also contributes to development of chronic vestibular symptoms. In a prospective study of patients with various vestibular disorders, patients with vestibular migraine—and not those with vestibular neuronitis or benign paroxysmal positioning vertigo—had significantly increased incidences of developing anxiety and phobic disorder (odds ratio 26.6), which was unrelated to degree of vestibular dysfunction on neurophysiological testing. The authors hypothesised that this may be due to the unpredictable course of the condition. Patients often perceive panic-like anxiety during episodes, which may be misdiagnosed as panic attacks while the diagnosis of vestibular migraine is overlooked.¹²

How is it diagnosed?**Clinical**

Vestibular migraine is a clinical diagnosis.¹ During attacks, patients may describe symptoms as rotational, an illusory sensation of movement of self or environment (including a feeling of rocking or that the head is spinning inside the skull), or intolerance of head motion.⁶

Useful discriminatory questions include asking about the presence of associated migrainous features, such as photophobia and phonophobia, and a history of motion sickness, while excluding symptoms suggestive of another diagnosis, such as prominent hearing loss or fluctuation.

Patients with migraine have increased susceptibility to motion sickness, a useful diagnostic, albeit not universally reported, feature. In a study with 131 migraineurs and 50 controls, the former were more prone to experiencing motion sickness after vestibular stimulation (89%) than were controls (45%). This proportion was highest in those with vestibular migraine, followed by migraine without vestibular symptoms, and finally controls.¹⁸

There may also be a history of periodic syndromes of childhood, including abdominal pain, cyclic vomiting, benign paroxysmal vertigo, and benign paroxysmal torticollis, which are considered migraine variants.^{9,13}

Examination

Physical findings are less sensitive and specific. While examination is often normal between attacks, a long term follow-up study of 75 vestibular migraine patients for a mean duration of 12.7 years detected at least one ocular motor abnormality, most commonly positional nystagmus, in 41% even when asymptomatic.¹⁴ During acute episodes, one study found spontaneous or positional nystagmus in 70% of patients, which resolved on follow-up after the attack. Balance impairment, evidenced by a positive Romberg test, was also present in 70% during acute attacks and 15% on follow-up.¹⁵

It is suggested that a brief examination should include gait, Romberg test, cranial nerve assessment focusing on eye movements for nystagmus and gross hearing abnormalities, and Dix-Hallpike manoeuvre if the history is suggestive of benign paroxysmal positional vertigo.

Questionnaires have proved useful in differentiating causes of vertigo. Zhao et al found a predictive accuracy of 92% for vestibular migraine versus ultimate clinical diagnosis using a standardised questionnaire (consisting of 86 questions relating to vestibular or neurological symptoms and 77 general health questions) in 619 patients attending a specialist dizziness clinic. Photophobia (odds ratio 41.8), relationship to menstrual cycle (odds ratio 6.9), and severe or recurrent headaches (odds ratio 5.5) had the greatest correlation with vestibular migraine.¹⁶

Investigations

Neuroimaging should be normal in vestibular migraine and is used primarily to exclude other causes of central vertigo, such as posterior circulation stroke or demyelination. If the clinical features are consistent and there are no red flags, then further investigations (including blood tests and neuroimaging) are not necessarily required for diagnosis. Consider neuroimaging for patients who present with vertigo and red flags (see below) that indicate a central cause, especially if vascular risk factors are present.

Vestibular neurophysiological testing, such as bithermal water caloric or rotary chair videonystagmography, is of limited usefulness in isolation and can show central, peripheral, mixed, or no abnormalities.¹⁷

Diagnostic pitfalls and red flags

When a patient first presents acutely with vestibular symptoms, posterior circulation stroke is the most important differential to consider as this requires urgent neuroimaging.

Red flags include the presence of central signs such as:

- Direction-changing, purely torsional, or vertical nystagmus
- Skew deviation and normal head impulse test (described in a *BMJ* article on posterior circulation stroke¹⁹)
- Other associated neurological deficits including:
 - Acute unilateral deafness
 - Dysarthria
 - Limb weakness, numbness, or incoordination
 - Severe gait ataxia to the extent of being unable to walk.¹⁹

Older age and presence of vascular risk factors increase the pretest probability of posterior circulation stroke.

Vestibular migraine and Ménière's disease share common features and may co-occur. Some 45% of patients with Ménière's disease have at least one migrainous symptom during attacks and an increased lifetime prevalence of migraine. While mild hearing impairment, aural fullness, and tinnitus can occur with vestibular migraine, prominent fluctuating hearing, unilateral hearing loss, and changes in pitch and loudness of tinnitus are highly suggestive of Ménière's disease. Low frequency hearing loss is characteristic, and its documentation, even if transient, is included in the new diagnostic criteria for Ménière's disease.⁸

Benign paroxysmal positional vertigo (BPPV) is a common cause of recurrent vertigo, but should be readily distinguishable from vestibular migraine given the short duration of vertigo with BPPV (usually 10-30 seconds) provoked by particular head movements. The Dix-Hallpike manoeuvre is positive in the 85% of cases in which the posterior semicircular canal is affected.⁸ While the Dix-Hallpike manoeuvre also provokes nystagmus in vestibular migraine patients, characteristics of nystagmus are different. In BPPV there is a latency period of a few seconds to onset of nystagmus, which is usually fast velocity, torsional, and fatigues after approximately 30 seconds. In contrast, nystagmus in vestibular migraine has no latency period, is generally of low velocity, horizontal (although a fifth may be vertical), and sustained.²⁰

Suspect vestibular migraine in younger patients if there is prominent nausea or vomiting, and in those not responding to repositioning manoeuvres.

How is it managed?

Management strategies include avoidance of triggers, pharmacotherapy, and vestibular rehabilitation. Given patients' motion sensitivity, advise them to avoid triggers known to induce vestibular symptoms where possible. Acutely, zolmitriptan and rizatriptan produced some reduction of vestibular symptoms in small randomised placebo-controlled studies.^{21,22} If nausea is present, antiemetics (such as prochlorperazine) can be used, albeit sparingly to avoid long term vestibular suppression.

For prophylactic therapy, there is one ongoing randomised controlled trial comparing metoprolol against placebo. Evidence is otherwise based on retrospective cohort studies, case series, and expert opinion, and guided by treatments for migraine. Options include tricyclic antidepressants (such as amitriptyline, nortriptyline, venlafaxine (reduced the mean number of vertigo attacks from 12.2 to 2.6 over four months in 31 patients)), antihypertensives (such as propranolol (reduced the mean number of vertigo attacks from 12.6 to 1.9 over four months in 33 patients) and candesartan), flunarizine (12% experienced high frequency vertigo attacks (>5 episodes/week) with daily flunarizine compared with 48% with acute symptomatic therapy after three months in 48 patients), and anticonvulsants (such as topiramate (mean monthly vertigo attacks reduced from 5.5 to 1 and mean monthly headache attacks reduced from 4 to 1 after six months in 30 patients) and sodium valproate (which must be avoided in women of childbearing age, and topiramate is associated with cleft palate)).²³

Several uncontrolled studies suggest vestibular rehabilitation—targeting habituation to visual motion stimuli for visually induced symptoms and postural instability—is beneficial.¹⁰ It is generally an adjunct to adequate preventive medications and reserved for more chronic symptoms.

A patient's perspective

I am 63 years old and have always considered myself to be fairly fit. I had occasionally suffered from migraines before but Migravele (combination paracetamol, buclizine, and codeine) was sufficient to deal with those.

In 2015 I had a sudden episode of extreme dizziness. The vision in my left eye was shifting rapidly from right to left, and then I was violently sick. This seemed to last for about an hour. I was admitted to hospital as an emergency and had a CT brain scan to rule out a stroke. I didn't have any headache at all during or afterwards.

In hospital I was told that I had labyrinthitis or benign positional vertigo, and I was sent home after 24 hours. My symptoms didn't settle so I went to see my GP, who was concerned I may have Ménière's disease. She referred me to the ENT balance clinic, where I was seen a month later. The consultant diagnosed vestibular migraine and prescribed amitriptyline. This helped for a while, but my symptoms got worse again and I was admitted to hospital in 2017 with recurring severe dizziness and vomiting. Eventually my consultant recommended I take topiramate instead. Since then I have not experienced any further episodes.

My symptoms during a severe vestibular migraine attack are dizziness, which can range from my vision swimming to a more extreme jumping from right to left. The sickness follows quickly and tends to be continuous, where I am unable to swallow even a drop of saliva without retching, for up to an hour. I have to lie down in a darkened room and simply allow it to pass.

Primary care perspective: local audit data

- In an audit of a general practice with 5500 patients, where co-author HM works, over a 12 month period, 259 patients (4.7%) had consultations coded as relating to "vertiginous syndromes" (which includes conditions such as benign paroxysmal positional vertigo (BPPV), Ménière's disease, and vestibular neuritis, but not vestibular migraine).
- 450 patients (8.2%) were recorded as having a history of migraine, of whom 35 (7.8%) also had a vertigo related code.
- Review of the records of these 35 patients showed that most patients had symptoms typical for BPPV. Two patients originally thought to have BPPV were re-diagnosed as having vestibular migraine by ENT specialists.
- Another eight patients (with GP diagnoses of BPPV (5), Ménière's disease (1), labyrinthitis (1), and vestibular neuritis (1)) fitted the ICHD-3 diagnostic criteria for vestibular migraine. This equates to a prevalence of 0.18%.
- Although these figures do suggest that vestibular migraine is underdiagnosed, and it is possible that the prevalence of 0.18% is an underestimate if patients were not asked about specific symptoms relating to the diagnostic criteria, this is still much lower than the reported lifetime and one-year prevalences of 1% and 0.9% respectively. However, the generalisability of the data is limited by the small sample size.

How patients were involved in the creation of this article

We were inspired to write this article after often seeing patients in primary and secondary care with dizziness, a notoriously difficult symptom for many patients to describe. Without a precise diagnosis, symptoms can become more frequent and disabling. After seeing many patients with diagnostic delay of over a year and subsequent good response to migraine prophylactic treatment, we realised that vestibular migraine is truly "easily missed," and one of our patients provided a written account of her experience.

We thank Catherine McArdle for article illustration, and the patient who provided the patient perspective.

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intellectual content; AT conceived of the article and revised it critically for important intellectual content.

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