An Insight about Vestibular Migraine; Diagnosis and Management

Soha Abd-Elraoof Mekki, Walied Mohamed Ibrahim, Ahmed Nashaat Shaaban, Dalia Helal Galhom

AudiovestibularMedicine Department, Faculty of Medicine, Zagazig University, Zagazig ,Egypt.

Corresponding author:Ahmed Nashaat Shaaban

E-mail: Da.ahmednashaat@gmail.com, A.nashat23@medicine.zu.edu.eg, ahmednashaat2023@gmail.com

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Abstract

Vestibular migraine (VM) is a syndrome characterized by recurrent episodes of vertigo or other vestibular symptoms attributed to migraine.Since 1984 several studies have investigated the association of vestibular symptoms and migraine in adults.The International Headache Society and the International Ba´ra´ny Society for Neurotology have developed a consensus document with diagnostic criteria for VM.The mechanisms underlying vestibular dysfunction that are related to migraine still need further study and clarification. One explanation proposed is a parallel activation of vestibular and cranial nociceptive pathways.Laboratory tests such as posturography, measurements of vestibular evoked myogenic potentials (VEMPs) and subjective visual vertical (SVV) have been used in different studies, but the results have been inconsistent.Meniere's disease is the main differential diagnosis. At an early stage of the disease it may be difficult to differentiate Meniere's disease from VM if aural symptoms are absent in Meniere's disease. Even with the presence of aural symptoms it may be difficult since auditory symptoms like hearing disturbances, tinnitus, and aural pressure have also been found in 38 % of VM patients.Only a few randomized controlled clinical studies have been conducted on the specific treatment of VM: during the attack or as prophylaxis. Two of these studies addressed the use of triptans for attack therapy. One study showed that 38 % of patients with VM attacks (3 of 8 episodes) benefitted from 5 mg zolmitriptan, whereas only 22 % in the placebo group (2 of 9 episodes) showed a positive effect.Prophylactic treatment was analyzed recently in The Cochrane Collaboration for randomized controlled trials in adults with the diagnosis of VM or probable VM.

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Introduction

Vestibular migraine is a syndrome characterized by recurrent episodes of vertigo or other vestibular symptoms attributed to migraine.

Since 1984 several studies have investigated the association of vestibular symptoms and migraine in adults (1). Various terms have been used to describe this combination including migraine-associated vertigo, migraine-associated dizziness, migraine-related vestibulopathy, migrainous vertigo, and benign paroxysmal vertigo.

Dieterich M, Brandt T ,(2) were the first to use the term 'vestibular migraine' (VM). VM is now the accepted name for vestibular symptoms that are causally related to migraine.

The International Headache Society and the International Ba´ra´ny Society for Neurootology have developed a consensus document with diagnostic criteria for VM (3).

Epidemiology :

Several Case-controlled studies support the clinical association of migraine and vertigo revealing that migraine is more common in patients with vertigo than in age- and sex matched controls and, also, that vertigo is more common in patients with migraine than in controls (1).

VM is considered the most common cause of recurrent spontaneous vertigo attacks. It has a lifetime prevalence of about 1 % and a 1-year prevalence of 0.9 % in the general population and accounts for about 7 % of patients seen in dizziness clinics and 9 % of patients seen in migraine clinics. (4).

VM occurs 1.5 to 5 times more often in women than in men (4).It has been proposed that VM has a genetic cause, namely an autosomal dominant pattern of inheritance with decreased penetrance in men. The migraine attacks can be replaced by isolated vertigo attacks in postmenopausal women (3). VM can develop at any age. It generally affects persons with a long-established history of migraine (4).

Epidemiological data confirm that migraine-related syndromes are also the most common cause of vertigo and dizziness in children . If the vertigo attacks in childhood take a monosymptomatic course without headache, they are called "benign paroxysmal vertigo in childhood". VM is with the most frequent form of vertigo in children followed by psychogenic/functional dizziness.(4).

The pediatric migraine variant of "benign paroxysmal vertigo in childhood" is characterized by brief attacks of vertigo associated with nystagmus that begin between the first and fourth year of life, last only seconds to minutes, and disappear spontaneously within a few years. It is benign and treatable. There are frequent transitions to other forms of migraine with and without aura (5).

Pathophysiology :

The mechanisms underlying vestibular dysfunction that are related to migraine still need further study and clarification. One explanation proposed is a parallel activation of vestibular and cranial nociceptive pathways. Experimental studies have demonstrated that trigeminal and vestibular ganglion cells share neurochemical properties and express serotonin, capsaicin, and purinergic receptors (6).

All of these structures play an important role in modulating the sensitivity of pain pathways. They are also involved in the formation of anxiety responses, thus explaining some aspects of the comorbidity of balance disorders, anxiety, and migraine (6).

The cortical regions activated by vestibular stimulation in human functional imaging studies include those also involved in pain perception, for example, the posterior and anterior insula, the orbitofrontal cortex, and the cingulate gyrus (2).A functional imaging study of two VM patients reported that the metabolism of the temporoparietal- insular areas and bilateral thalami increased during the attack. The cause was ascribed to increased activation of the vestibulo-thalamo-cortical pathways. Additional bilateral cerebellar activation was thought to be due to an adaptive process that suppresses the hyperactive vestibular system (6).

Thus, all these findings of the imaging studies indicate that there is a strong overlap of the vestibular and pain pathways at brainstem, thalamic, and cortical levels. Reciprocal connections between the trigeminal and vestibular nuclei were identified in the one human study that has been performed **by Marano, et al., at** (7)that showed that trigeminal activation produced nystagmus in patients with migraine but not in healthy controls. This was attributed to a lowered threshold for signal transmission between the two systems.

Various studies have discussed this feature, which indicates an increased vestibular excitability (hyperexcitability). Such an increase can include increased motion sensitivity, even motion sickness , decreased suppression of the otoacoustic emissions and reduced perceptual thresholds of dynamic head movements. The mechanisms underlying these changes still remainunclear (8).

Migraine-related vestibular disorders like VM may be caused by enhanced excitability occurring during the processing of sensory information, which is due to a genetic susceptibility. The enhanced excitation induces interactions of vestibular and pain pathways on several levels, from the inner ear to the thalamus and cortical level (9).

Diagnostic criteria :

Vestibular migraine: International Classification of Headache Disorders (ICHD-3) and International Classification of Vestibular Disorders (ICVD) ;

At least five episodes fulfilling criteria A and C

A. A current or past history of Migraine without aura or Migraine with aura

B. Vestibular symptoms of moderate or severe intensity, lasting between 5 minutes and 72 hours

C. At least 50% 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

Probable vestibular migraine (ICVD)

A. At least five episodes with vestibular symptoms of moderate or severe intensity, lasting 5 min to 72 hours

B. Only one of the criteria A and C for vestibular migraine is fulfilled (migraine history or migraine features during the episode)

C. Not better accounted for another vestibular or ICHD

Clinical characteristics :

Symptoms :

Spontaneous vertigo has been reported to occur in 21–83 % , positional vertigo and dizziness in 17–65 % , and head motion intolerance in 31–77 % of patients with VM **(2).** In a large population study based on telephone interviews, 67 % of the participants with VM reported spontaneous rotational vertigo, whereas 24 % had positional vertigo **(4).** Vertigo has also been induced by moving visual objects **(10).**

In addition, the most common additional symptoms were unsteadiness (91 %), balance problems (82 %), and vertigo (57 %); these are vestibular symptoms that do not fulfill the diagnostic criteria of the International Ba´ra´ny Society for VM **(11).**

Attack duration can vary from seconds to days however, the diagnostic criteria for VM require a 5-min. minimum. Attacks lasting 5 to 60 min and fulfilling typical aura criteria were found in only 10-30 % of VM patients, i.e., most patients did not meet the International Headache Congress (IHC) criteria**(4)**.

An association of vestibular symptoms and headache is frequently seen, but it varies from patient to patient and from attack to attack, even in the same patient. Vertigo can precede or occur during or after headache . While less than 50 % have both symptoms in every attack, about 6 % report isolated vertigo attacks that alternate with migrainous headache symptoms **(4)**.

Along with vertigo, patients may mention photophobia, phonophobia, osmophobia, visual and other auras that are relevant for a confirmation of the diagnosis. Auditory symptoms like hearing loss, tinnitus, and aural pressure have been found in 38 % of patients, but hearing is usually only mildly and transiently affected **(12).**

Clinical examination in the symptom-free interval is generally normal. However, central vestibular ocular motor abnormalities occur in 8.6 to 66 % of the patientsincluding gaze-induced nystagmus, saccadic pursuit, central positional nystagmus, dysmetric or slow saccades **(13)**.

The most frequent abnormality was central positional nystagmus **(14).**Unilateral peripheral vestibular signs such as canal paresis have been reported in 8 to 22 % and bilateral vestibular failure in up to 11 %. During the acute attack more patients (70 %) developed pathological nystagmus with either spontaneous or positional nystagmus **(13)**.

Such findings made during the acute attack represent signs of a central vestibular dysfunction in 50 % and of a peripheral vestibular dysfunction in 15 %; the site of involvement was unclear in 35 %. Hearing was not affected in these patients **(15).**

Mild cochlear loss involving low frequencies has been documented in 3 to 12 % and mild bilateral sensorineural hearing loss in 18 % in a follow-up study conducted over 9 years as a mean **(14).**

Neurophysiological testing :

Laboratory tests such as posturography, measurements of vestibular evoked myogenic potentials (VEMPs) and subjective visual vertical (SVV) have been used in different studies, but the results have been inconsistent.

An increased postural sway was documented by posturography**(13)**. The cervical and ocular vestibular evoked myogenic potentials (cVEMP/oVEMP), the widely used laboratory tests of otolith function, have also shown conflicting results in VM patients. Some studies have reported reduced amplitude or delayed latencies of VEMP responses**,** whereas other studies have found asymmetrical VEMP responses with normal latencies and amplitudes (99,100).The measurements of SVV did not differ from those recorded in healthy controls **(16).**

Differential diagnosis/comorbidity :

Meniere's disease is the main differential diagnosis. At an early stage of the disease it may be difficult to differentiate Meniere's disease from VM if aural symptoms are absent in Meniere's disease. Even with the presence of aural symptoms it may be difficult since auditory symptoms like hearing disturbances, tinnitus, and aural pressure have also been found in 38 % of VM patients **(12).**

Several studies have pointed to a link between Meniere's disease and VM. The prevalence of migraine in patients with Meniere's disease is reported to be twice as high as in healthy subjects, and the most reliable differentiating feature is the low-frequency hearing loss in Meniere's disease **(14).**

A retrospective study showed that 13 % of patients fulfilled the criteria for both disorders, thus making the differential diagnosis even more complicated **(12).** Indeed, an inner ear MR imaging study applying gadolinium-based contrast agent transtympanically showed an cochlear and vestibular endolymphatic hydrops in four of 19 VM patients (21 %) who presented with auditory symptoms. This can either be explained by a coincidence of Meniere's disease and VM or by the hypothesis that the hydrops is the consequence of a inner ear damage due to VM**(17).**

Meniere's disease and VM have also been considered part of a broad spectrum of disorders having a possible common genetic basis **(18).**

Benign paroxysmal positional vertigo (BPPV), for example, must also be considered in the differential diagnosis in those patients presenting with positional vertigo attacks, because BPPV is also commonly associated with migraine **(3).**

Anxiety is a common comorbidity of migraine and is frequently associated with vestibular disorders, especially with VM. To define this association a new disorder named MARD (migraine–anxiety-related dizziness) has been proposed **(19).**

Treatment :

Only a few randomized controlled clinical studies have been conducted on the specific treatment of VM: during the attack or as prophylaxis.

Two of these studies addressed the use of triptans for attack therapy. One study showed that 38 % of patients with VM attacks (3 of 8 episodes) benefitted from 5 mg zolmitriptan, whereas only 22 % in the placebo group (2 of 9 episodes) showed a positive effect. Prophylactic treatment was analyzed recently in The Cochrane Collaboration for randomized controlled trials in adults with the diagnosis of VM or probable VM **(20).**

According to the Ba´ra´ny Society/International Headache Society criteria. Only 1 out of 558 studies could be identified which was based on the new criteria for VM and had adequate study

conditions. This study comparing metoprolol and placebo is still ongoing. Since none of the available studies to date are adequate, most therapeutic recommendations for the prophylactic treatment of VM are nowadays based on the therapy guidelines for migraine with and without aura **(20)**.

Therapeutic approaches that refer specifically to VM are found in case reports, retrospective cohort studies, and open-label trials. A large retrospective cohort evaluation of 100 patients (median age 47 years, range 21–72 years) compared VM patients with and without prophylactic migraine treatment. All patients on prophylactic treatment showed a decrease of duration, intensity, and frequency of episodic vertigo as well as its associated features (p\0.01). **(20).**

The drugs taken were metoprolol (49 patients, 69 %; median dose 150 mg) or propranolol (31 %; median dose 160 mg), valproic acid (6 patients, 8 %; median dose 600 mg), topiramate (6 patients, 8 %; median dose 50 mg), butterbur extract (4 patients, 5 %; median dose 50 mg), lamotrigine (3 patients, 4 %; median dose 75 mg), amitriptyline (2 patients; 100 mg and 75 mg), flunarizine (1 patient; 5 mg), or magnesium (3 patients; median dose 400 mg). The group not receiving prophylactic therapy but instead following a modified lifestyle showed a reduction of only vertigo intensity **(21).**

Cinnarizine was tested in a retrospective, single-center, open-label investigation on VM and migraine associated with vertigo. The study included 24 patients with VM (23 women, 1 man) and 16 patients with basilar-type migraine (12 women, 4 men). The patients' ages ranged from 18 to 54 years (mean 30 years). The mean frequency of vertigo and also the mean frequency, duration, and intensity of migraine headaches per month were significantly reduced after 3 months of cinnarizine therapy (all p\0.001) **(22).**

Less established medications in migraine treatment such as benzodiazepines, selective serotonin reuptake inhibitors (SSRI), pizotifen, dothiepin, acetazolamide, and behavioral modification including special diets were reported to have positive effects on VM. However, a clear therapeutic recommendation for the specific treatment of VM cannot be easily drawn from these data. Moreover, it must be taken into account that inconsistent definitions of VM were used in many of these studies especially in the older ones, so that the examined cohorts were quite heterogeneous. The new diagnostic criteria will eliminate this obvious shortcoming in the future and lead to more comparable, better-quality studies **(23).**

Vestibular rehabilitation training proved effective inVM patients as add-on treatment to medical therapy or as a standalone treatment option. This agrees with the well-known positive effect of physical activity on the reduction of migraine attack frequency. However, a study with a controlled design is still needed for VM **(24).**

We could summarize lines of treatment of VM as follows :

1- Life style changes including the improvement of sleep quality and VRT .

2- Prophylactic treatment :

- B blockers
- Ca ch. Blockers
- Antiepileptic
- Antidepressants
- TCAs

3- Treatment during acute attack :

- Analgesics

No Conflict of interest.

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