Vestibularmigraine-A Challenging Clinical Entity Rhinoscleroma-A Rare Granulomatous Disease in a Child

Santosh Kumar Swain[1], Priyanka Debta[2], Smarita Lenka[3], Smrutipragnya Samal[3], Anurag Dani[4], Somalee Mahapatra[5]

[1]Professor, Department of Otorhinolaryngology, IMS and SUM Hospital, [2]Professor, Department of Oral Pathology and Microbiology, Institute of Dental Sciences, [3]Ph.D. Scholar, Medical Research Laboratory, IMS and SUM Hospital, Siksha O Anusandhan Deemed to be University, K8, Kalinga Nagar, Bhubaneswar-751003, Odisha, [4]Professor, Department of Prosthodontia, C.D.C.R.I. Rajnandgaon, Chhattisgarh, [5]Tutor & Ph.D. Scholar, Institute of Dental Sciences, Siksha O Anusandhan Deemed to be University, K8, Kalinga Nagar, Bhubaneswar-751003, Odisha, India

Abstract

Vestibular migraine (VM) is a distinct clinical entity which accounts for major vestibular symptoms among the adult and children. It is presently thought of as a major etiology for episodic dizziness. The pathophysiology for VM is not completely understood and is always a puzzling dilemma. Patients often present with vertigo, headache, photophobia, and phonophobia. The clinical examinations and laboratory investigations are usually within normal limits. The diagnosis of VM is often challenging as there are no confirmatory tests available. The treatment is often similar to the migraine headache. The present-day management is to take the similar prophylactic medications needed for migraines such as beta-blockers, antidepressants, and anticonvulsants drugs. It is always a challenging disease for clinicians and often creates a puzzle for diagnosis and treatment. Accurate management of VM needs a proper understanding of the present literature which are discussed details in this review article.

Keywords: *Migraine,Vertigo,Vestibular migraine, Migraine related vertigo.*

Introduction

Dizziness is a common clinical symptom in daily medical practice. The patient presenting migraine along with vertigo or dizziness is called Vestibular migraine (VM). It is also called as migraine-related vertigo (MRV), migraine-associated vertigo (MAV), and basilar artery migraine or migrainous vertigo. This clinical entity is a type of migraine leads to vertiginous presentations along with the classical symptoms of migraine. VM was first described by Dieterich and Brandt in 1999[1] and it corresponds to a type of migraine where important symptom is vestibular. It is more commonly found in persons with the absence of aura and predominantly involves female, as a ratio of 5:1(F/M).[2] It is documented that 1% of the population suffers from VM which accounts for the commonest central etiology of vertigo and the second commonest cause of vertigo in total.[3] VM is often confused with vestibular disorders which are an important cause for dizziness. In clinical practice, common disorders that manifest in vertigo are benign paroxysmal positional vertigo (BPPV), Meniere's disease, vestibular migraine,and vestibular neuronitis in falling order of frequency.[4] VM represents the 2nd commonest cause for vertigo after benign paroxysmal positional vertigo.[5]

Corresponding Author:
Santosh Kumar Swain
Professor,Department of Otorhinolaryngology, IMS and SUM Hospital, Siksha O Anusandhan Deemed to be University, K8, Kalinga Nagar, Bhubaneswar-751003, Odisha, India
e-mail: santoshvoltaire@yahoo.co.in

Method

A search was done on medical literature with the help of Pub Med (MEDLINE), SCOPUS, and Google Scholar. The literature search was done between 1980 to 2018 years with the help of the keywords of migrainous vertigo,vestibular migraine, migraine-related vertigo, and migraine-associated vertigo. Articles were selected based on pathophysiology, epidemiology,clinical presentations,diagnosis, and treatment. A sum of 38 manuscripts was found and the detailed search was summarized in our review article.

Epidemiology: VM is more commonly seen than other vestibular disorders.[6] Vertigo and migraine are common clinical entity which affects 7% and 14% of the general population respectively. The simultaneous occurrence of vertigo and migraine may be one percent if found at random. Moreover, a present study documents that 3.2% of the populations have vertigo and migraine. [7] It affects females about three times more common than males. It has been reported that lifetime migraine prevalence is 16%, lifetime vertigo prevalence is of 7%, and a co-morbidity of 3.2% rather thana 1.1% expected chance of individual.[8]One study documented that VM has a prevalence of 0.89% in a year and constitutes for approximately ten percent of patients found for vertigo and approximately ten percent of patients seen for migraines.In one study, the 1-year prevalence of VM in females aged 40-54 years is 5%.[9]

Etiopathology: The basic pathophysiology is trigeminovascular reflexfor vestibular migraine is aparasympathetic reflex such as trigeminovascular reflex which causes vasodilatation of the large intracranial vessels. The trigeminal nucleus caudalis is activated and C1-C2 dorsal horn neurons cause vasodilatation of intracranial blood vessels.[10] In trigeminovascular reflex, the vasodilatation effect of parasympathetic stimuli may be activated by neurokinin A(NKA), calcitonin gene-related peptide (CGRP) and substance P(SP) released from trigeminal nerve endings.[11] The neural pathway for the vestibular system often give to both peripheral and central migrainous mechanism. [12] There are two possible mechanisms for explaining the vertigo in migraine. Transient vertigo has been thought to be a brainstem aura that may be related tothe alteration inflow of the blood.[13]Also there is direct communication from the posterior part of the parietal cortex into the vestibular nuclei which gives straight access to cortical mechanisms towards migrainous aura to connect vestibular information processing and reflex action. Few studies documented that repeated circulation/vascular problems like ischemia due to vasospasm of the inner ear and extravasations of plasma during migraine attack may lead to injury to vestibule and cochlea permanently.[14,15] The symptomatic presentations of patients often the same to peripheral vestibulopathy. Also,abnormality in ion-channel defect and calcium channel alters labyrinthine function and its central pathways often give a consistent hypothesis for the management of VM.[16]

Genetics: Different studies have documented the genetics of the VM. Series of cases documented a hereditary risk towards prevalent among patients suffering from VM, but these risk factors cannot be associated with any particular genetic alteration. One study was done among twenty-four patients suffering from recurrent benign vertigo and two hundred twenty family members who underwent a clinical assessment, revealed forty percent of the first degree relatives suffering from the same type of recurrent vertigo episodes whereas in contrast to 2% of unrelated spouses.[17] One study reported that VM might be heterogeneous or monogenic.[18]There is no relation between sodium and gene linking to calcium channel for familial migraine.[19] There is a location at chromosome 11q which commonly seen in females among familial migraine-related vertigo. [20]There is 12.0MB interval on chromosome 5q35 which contain gene of familial migraine-related vertigo. [21]Etiopathology for VM is still unclear.

Clinical Presentations: VM includes the clinical symptoms such as vertigo along with clinical manifestations of migraine. The vestibular manifestations by migraine usually mimicsome other labyrinthine lesions like benign paroxysmal positional vertigo and episodic vertigo in Meniere's disease.[22] Patient often complaints episodic sensation of spinning,imbalance or sensation of rotation or giddiness or feeling of light headedness last for seconds to hours or days. The patient often presents with severe episodic pulsating headache. The patient has usually no hearing loss when associated with a classical type of migraine. In the majority of cases of basilar migraine, patients present with the sensorineural type of hearing loss and ringing sound in the ear which may mimic the Meniere's syndrome. The physical examinations of patients suffering from MRV are usually normal between two episodes. During episodic attack, the patients generally manifest a nystagmus either peripheral or central vestibular

abnormality. The non-paroxysmal type of positional nystagmus is often seen during the episodic attack of VM.

The peripheral vestibular lesions whichmimic to VM areendolymphatic hydrops,benign paroxysmal positional vertigo,vestibular neuritis,and perilymph fistula. The central lesions which mimic to VM are transient ischemic accident,multiple sclerosis,vestibular-basilar artery insufficiency, neurodegenerative disorders, and familial ataxia syndrome.[23] The International Headache Society(HIS) has declared established diagnostic criteria of migraine (Table 1).[24] However, the vertigo is found in this classification only in respect of benign paroxysmal positional vertigo and basilar migraine. So, it is thought the higher prevalence of VM is more than the chance of association.

The classification of migraine is into: 1. Common migraine(without aura)-There include unilateral and pulsating headache. The headache is more by photophobia (sensitivity to light), phonophobia(sensitivity to sound), and physical activity.All neurological tests are usually normal; 2. Classical migraine(with aura)-There are 2 to 3 episodes of headache which proceeded by reversible CNS problems like ataxia, dysarthria, diplopia, one side numbness/weakness,vertigo, and tinnitus. This phase is known as aura and neurological investigation is within normal limits; 3. Basilar migraine(Type of classical migraine)-There are presentations of spasm of the basilar and vertebral artery. There are brain stem hypoxia featureslike dysarthria, diplopia,ringing sound in the ear,vertigo,hearing loss, low level of consciousness, and weakness/numbness of limb. The symptoms stay for few minutes to hours. The headache often originates at the cervical and occipital areas; 4. Vestibular migraine-Vestibular presentations are additional features due to spasm of vestibule-cochlear artery along with classical migraine; 5. Complicated migraine/Migrainous infraction-It is a classical type of migraine but the neurological presentations do not become normal in one week and MRI reveals an area of ischemic infarction of the brain. VM was jointly described by Barany Society and the subcommittee of IHS.[25] It is seen in the appendix of the 3rd edition of HIS as a first stage for new clinical types.[26] The criteria for the diagnosis of VM which accepted internationally are based onvestibular clinical presentations and migraine symptomatology of moderate to severe, a past migraine history, a temporal association between migraine symptoms, and vestibular symptoms. The duration of acute episodes is often limited between 5minutes to 72 hours. The clinicians should find any aural symptoms to differentiate between Meniere's disease and VM (Table.2). VM is a multi-factorial chronic disease and common among genetically susceptible people. It is characterized by headaches with phonophobia, photophobia, vertigo, nausea, and vomiting. VM affects around 18% female and 6% male presenting neuro-otological manifestations like vertigo,decreased hearing, ringing sound in the ear, and fullness of the ear during crisis. Patients may present this symptomatology without the presence of aheadache.[27] The physical assessment is often normal between the attacks. At the time of the attack of migraine-related vertigo, patients often present a nystagmus that suggests neither peripheral nor central vestibular abnormality. During the attack of vestibular migraine, non-paroxysmal positional nystagmus is common.[28] Loss of hearing is never a clinical presentation of classical and common type of migraine but sensorineural hearingloss or ringing sound in ear is associated with 80% cases of basilar migraine resembling to the Meniere's syndrome. During aura,positional or spontaneous nystagmus can be seen whereas there are no neurological deficits inpatient. There is often familial history of headache is found. The aggravating factors are mental and physical stress,menstrual period,taking contraceptive pills, smoking habits,exposure to light and sound,deprivation of sleeping,staying in an empty stomach,and a certain diet. Vertigo in the migraine patient may go to the presentations of headache and be a part of the migrainous aura. It is often difficult to think whether migraine and vertigo are two separate presentations with similar etiopathology.

Diagnosis: The diagnosis of VM is often difficult as there are no gold standard tests available for getting the diagnosis. The clinical diagnosis of VM may be difficult as it shares features with many clinical conditions. There is no worldwide decision for a group of clinical presentations covered under this disease or what medical term should be utilized. The vestibular symptoms and headache in VM may not be temporarily associated, which often hide the association. The newer guidelines for diagnosis of VM need a minimum of 5 episodic vestibular symptomatic attacks ranging from moderate to severe grade of intensity. The vestibular episodic attacks varying in length,span from few seconds to days and most of fall between 5minutes to 72 hours.[29] Diagnostic tests often show non-specific abnormal results which are also found in migraine patients who do not have

vestibular symptoms.Laboratory tests like complete blood count(CBC),C-reactive protein(CRP),erythrocyte sedimentation rate (ESR) are usually done in all cases of VM. The confirmatory diagnosis of VM needsto rule out of the vestibular symptoms. For excluding the vestibular causes, the different vestibular function testing,hearing assessment,and neuro-imaging are required. Vestibular-evoked myogenic potential(VEMP) is an investigation for vestibulocollic reflexes and peripheral vestibular excessive sensitivity to loud noise which helpful for diagnosis of VM.VEMPs have abnormal reporting in VM patients but the findings are usually heterogeneous. These findings show lower electromyography (EMG) amplitudes,bilateral or unilateral loss of cervical VEMP responses,shifting of maximum VEMP response from 500 to 1000Hz, and increased latencies.[30] VEMP findings are not very specific for VM .Approximately 38% of VM patients present with cochlear features like decreased hearing,ringing sound in-ear,and fullness of ear.[31] The loss of hearing loss in VM varies from mild to moderate degree without much progression. There is documentation of mild both sides downward sloping type of hearing loss over many years among patients of VM.[32]Caloric electronystagmography (ENG) may be needed to differentiate peripheral vestibular diseases from VM.There is a reduced caloric response in peripheral vestibular hypo-function,labyrinthitis and vestibular neuritis.[33] A video head impulse test is useful to differentiate the vestibular disorders from VM.[33] MR angiographyor MRI brain can rule out intracranial lesions for vertigo-like cerebrovascular diseases.[33] Swaying sensation rather than vertigo is described by the patients of cerebrovascular diseases along with neurologic findings like diplopia,visual field loss,limb weakness, or sensory loss.[32]As per a new study, there isan alteration of gray matter in VM in comparison to the control group with raised gray matter mass of frontal lobe, temporal lobe of left side,left thalamus and occipital lobe and reduced gray matter in the left cerebellum.[34]It also needsan examination of MRI for the VM patients. Caloric hypoactivity, oculomotor abnormalities, and hearing loss are rarely seen in VM.

Physiological Tests: Physiological tests are not sufficient alone for diagnosis of the VM as these are inconsistent and patients have a high incidence of VM without vestibular presentations.[35] However, the physiological tests may be employed to differentiate from other vestibular lesions and to confirm the vestibular lesions if present. Approximately ten to twenty percentages of the patients of VM have one side decrease in labyrinthine activity.[36] Patients with MRV have increased postural sway than patients with no VM. There is reduced amplitude in vestibular evoked myogenic potentials in patients of VM.[37]

Treatment: The management of VM needs treatment of vertigo attack and prophylactic treatment. The drugs used for prophylaxis are the same as for migrainous headache which includes beta-antagonist, anti-depressants, and anticonvulsants.[38] There are two treatment options and these are prophylactic and abortive medications for migraines which can be used for the treatment of VM. One study documented 38% of VM patients responded to Zolmitriptan versus placebo with 22%.[39] The drugs that are prescribed for prophylaxis in migraine patients can also be used for the VM. Different drugs are flunarizine, propranolol, bisoprolol, and metoprolol.[40,41] Serotonin has an important role in the pathophysiology of migraine and also causes vestibular symptoms. Deprivation of the amino acid such as tryptophan which is used in serotonin synthesis resulting in more vertigo.[42] Tricyclic antidepressant which enhance central serotonin level may be useful in prophylactic medication of VM particularly in anxiety associated patients.[43] GABA like drugs such e.g. gabapentin are also helpful for patients with VM.[44]

Table 1: Diagnostic criteria of Vestibular migraine(International Headache Society and Barany Society)

Vestibular migraine
A. At least five episodes of vestibular symptoms of moderate to severe intensity lasting 5min-72hours.
B. Current or previous history of migraine +/- aura according to the International Classification of Headache Disorders (ICHD).
C. One or more migraine features ++ with at least 50% of the vestibular episodes.
D. Not better accounted for by another vestibular or ICHD diagnosis.
Probable vestibular migraine
A. At least five episodes with vestibular symptoms+ of moderate to severe intensity lasting 5min-2 hours.
B. Only one of the criteria B and C for vestibular migraine is fulfilled.
C. Not better accounted for by another vestibular or ICHD diagnosis.

Table 2: Difference (Clinical presentations) between Vestibular migraine and Ménière's disease.

Clinical Presentations	Vestibular migraine	Ménière's disease
Headache	Present	Absent
Vertigo	Present and less duration	Present and more than 24hours duration
Family history of headache	Present	Absent
Phonophobia and photophobia	Present	Absent
Hearing loss	Absent	Present
Sensation of ear blockage	Absent	Present
Tinnitus	Absent	Present
Antimigraine medications	Good response	No response

Conclusion

Exact diagnosis of VM is often a taxingsituation for clinicians. The pathophysiology for VM is always a puzzling dilemma for clinicians. The increased prevalence of VM and its impact on quality of life need more understanding of the pathophysiology for better care of VM. The presence of two symptoms of vertigo and headache simultaneously does not represent a definite causal relationship. There is always a challenge for the VM from both basic science and clinical aspect to enable appropriate and ethical treatment of this disease. In VM, the patient's profile is commonly young adult female or male and clinical presentations like vertigo of variable duration and headache. Each episode of vertigo is usually rotatory sensation and or feeling of unsteadiness which lasts for minutes to hours. Other clinical presentations are bilateral aural fullness, photophobia, phonophobia, and tinnitus. During taking history, most of the VM patients have motion sickness. VNG often reveals positional nystagmus not focusing on central or peripheral lesions. Migraine prophylaxis is often helpful for the treatment of VM.

Conflict of Interest: Nil

Funding: None

Ethical Permission: Approved

References

1. Dieterich M, Brandt T. Episodic vertigo related to migraine (90cases): vestibular migraine? J Neurol 1999;246:883-92.
2. Furman JM, Marcus DA, Balaban CD. Vestibular migraine: clinical aspects and pathophysiology. Lancet Neurol 2013;12:706-15.
3. Maldonado Fernández M, Birdi JS, Irving GJ, Murdin L, Kivekäs I, Strupp M. Pharmacological agents for the prevention of vestibular migraine. The Cochrane Library 2015.
4. Strupp M, Brandt T. Peripheral vestibular disorders. Curr OpinNeurol 2013;26:81-9.
5. Lempert T, Neuhauser H.Epidemiology of vertigo, migraine and vestibular vertigo.J Neurol 2009;256:333-38.
6. Cherchi M, Hain TC. Migraine-associated vertigo. Otolaryngol Clin North Am2011; 44: 367–75.
7. Pagnin P, Giannoni B, Pecci R. Epigone migraine vertigo (EMV): a late migraine equivalent. Acta Otorhinolaryngol Ital 2014; 34(1):62–70.
8. Neuhauser HK, Radtke A, von Brevern M, et al. Migrainous vertigo: prevalence and impact on quality of life. Neurology2006; 67: 1028–33.
9. Hsu LC, Wang SJ, Fuh JL. Prevalence and impact of migrainous vertigo in mid-life women: a community-based study. Cephalalgia2011; 31: 77–83.
10. Goadsby PJ, Lipton RB, Ferrai MD.Migraine-Current understanding and treatment. N Engl J Med 2002;346:257-70.
11. May A, Goadsby PJ. The trigeminovascular system in humans:pathophysiologynimplicatio ns for primary headache syndrome of the neural influences on the cerebral circulation.J Cereb Blood Flow Metab 1999;19:115-27.
12. Furman JM, Marcus DA, Balaban CD.Migrainous

vertigo:development of a pathogenetic model and structured diagnostic interview.Curr Opin Neurol 2003;16:5-13.

13. Lee J, Jung J, Cjung Y, suh M. Clinical manifestation and prognosis of Vestibular Migraine according to the vestibular function test results. Korean J Audiol. 2013;17(1):18–22.
14. Parker W. Meniere's disease. Etiologic considerations. Arch Otolaryngol HeadNeck Surg1995;121:377–82.
15. Radtke A, Lempert T, Gresty M, Brookes G, Bronstein A, Neuhauser H. Migraineand Meniere's disease: is there a link? Neurology 2002;59:1700–04.
16. Kolkiela EA, Elsanadiky HH, Nour YA. A study of the correlation between Migraine and Vestibular Vertigo. Egyptian Journal of Ear, Nose, Throat and Allied Sciences 18 (2017) 95–101.
17. Oh AK, Lee H, Jen JC, Corona S, Jacobson KM, Baloh RW. Familial benign recurrent vertigo. Am J Med Genet 2001;100(4):287–291.
18. Radtke A, Neuhauser H, von Brevern M, Hottenrott T, Lempert T. Vestibular migraine-validity of clinical diagnostic criteria.Cephalalgia2011; 31: 906–13.
19. Neuhauser H, Lempert T. Vestibular migraine. Neurol Clin2009; 27: 379–91.
20. Cohen JM, Bigal ME, Newman LC. Migraine and vestibular symptoms-identifying clinical features that predict "vestibular migraine". Headache2011; 51: 1393–97.
21. Millen SJ, Schnurr CM, Schnurr BB. Vestibular migraine: perspectives of otology versus neurology. Otol Neurotol2011; 32: 330–37.
22. Cha YH, Lee H, Santell LS, Baloh RW. Association of benign recurrentvertigo and migraine in 208 patients. Cephalalgia 2009;29:550–5.
23. Udagatti VD, Kumar RD.Migraine related vertigo.Indian J Otolaryngol Head Neck Surg2017;69(4):563-67.
24. International Headache Society Classification Subcommittee. Internationalclassification of headache disorders, 2nd edition. Cephalalgia 2004;24(1):1–160.
25. Lempert T, Olesen J, Furman J, et al. Vestibular migraine: diagnostic criteria. J Vestib Res. 2012;22(4):167–172.
26. International classification of headache disorders, 3rd edition (beta version), Cephalalgia 2013;33:629–808.
27. Dash AK, Panda N, Khandelwal G, Lal V, Mann SS. Migraineand audiovestibular dysfunction: is there a correlation? Am JOtolaryngol 2008;29:295-9.
28. Polensek SH, Tusa RJ. Nystagmus during attacks of vestibular migraine: an aid in diagnosis. Audiol Neurootol2009; 15: 241–46.
29. O'Connell Ferster AP, Priesol AJ, Isildak H. The clinical manifestations of vestibular migraine: A review. Auris Nasus Larynx 2017; 44:249–52.
30. Boldingh MI, Ljøstad U, Mygland A, Monstad P. Vestibular sensitivity in vestibular migraine: VEMPs and motion sickness susceptibility. Cephalalgia 2011;31:1211–9.
31. Neff BA, Staab JP, Eggers SD, Carlson ML, Schmitt WR, Van AbelKM, et al. Auditory and vestibular symptoms and chronic subjectivedizziness in patients with Me´nie`re's disease, vestibular migraine, andMe´nie`re's disease with concomitant vestibular migraine. Otol Neurotol 2012;33:1235-44.
32. .Radtke A, von Brevern M, Neuhauser H, Hottenrott T, Lempert T. Vestibular migraine: long-term follow-up of clinical symptoms and vestibulo-cochlear findings. Neurology 2012;79:1607–14.
33. Cohen JM, Escasena CA. Headache and dizziness: how to differentiate vestibular migraine from other conditions. Curr Pain Headache Rep 2015;19:31.
34. Casani AP, Sellari-Franceschini S, Napolitano A, Muscatello L, Dallan I. Otoneurologic dysfunctions in migraine patients with or without vertigo.Otol Neurotol2009; 30:961-67.
35. Celebisoy N, Gokcay F, Sirin H, Bicak N. Migrainous vertigo: clinical, oculographic and posturographic findings.Cephalalgia2008; 28:72–77.
36. Boldingh MI, Ljostad U, Mygland A, Monstad P. Vestibular sensitivity in vestibular migraine: VEMPs and motion sickness susceptibility. Cephalalgia2011; 31:1211–19.
37. 37.Messina R, Rocca MA, Colombo B, Teggi R, Falini A, Comi G, et al. Structural brain abnormalities in patients with vestibular migraine. J Neurol 2017;264:295–303.

38. Bisdorff AR. Management of vestibular migraine. Ther Adv Neu-rol Disord. 2011;4:183-91.
39. Neuhauser H, Radtke A, von Brevern M, Lempert T. Zolmitriptan fortreatment of migrainous vertigo: a pilot randomized placebo-controlledtrial. Neurology 2003;60:882–3.
40. Stolte B, Holle D, Naegel S, Diener HC, Obermann M. Vestibular migraine. Cephalalgia. 2015; 35(3):262-70.
41. Swain SK, Mohanty S, Sahu MC. Migraine-related vertigo in an elderly male. Apollo Med 2018;15:112-5.
42. Drummon PD. Effect of tryptophan depletion on symptoms of motionsickness in migraineurs. Neurology 2005;65:620–2.
43. Fotuhi M, Glaun B, Quan SY, Sofare T. Vestibular migraine: a critical review of treatment trials. Journal of neurology2009;256(5):711-6.
44. Brodsky JR, Cusick BA, Zhou G. Evaluation and management ofvestibular migraine in children: experience from a pediatric vestibularclinic. Eur J Paediatr Neurol 2016;20:85–92.