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Review Article

**EMERGING THERAPEUTIC APPROACHES FOR VERTIGO
AND DIZZINESS MANAGEMENT****J.S Venkatesh¹, Vinuth Chikkamath², Naresha A G³, Nikitha Prakash⁴, Nishana P N⁵,
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Abstract:

Differentiating between peripheral and central vertigo can typically be made as soon as the patient has had a clinical examination, allowing for the early diagnosis and subsequent therapeutic recommendations. The majority of vertigo patients can be effectively managed on a general practitioner level with only periodic otolaryngological management, negating the need for sophisticated clinical tests.

Keywords: vertigo , dizziness , Ménière's disease, vestibular system, otolaryngology

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INTRODUCTION:

According to epidemiological data, between 5 and 7% of all patients who visit general practitioners (GPs) experience vertigo and balance issues. These individuals are thought to make up 10–12% of otolaryngologists' patient base. Patients of all ages may experience vertigo, however as they age, the condition becomes more common. Vertigo ranks third on the list of the most frequent reasons for healthcare visits among adults over 65. Accurately identifying the root cause of the symptoms is essential for effective treatment, albeit this can be challenging when dealing with vertigo. Identifying the nature of the reported symptoms rather than offering a solution is the first and most crucial step in diagnosing a patient with vertigo. This involves conducting a thorough medical interview in which, in addition to asking about concurrent conditions and medications, details about the patient's symptoms, frequency and duration, the presence of aggravating or triggering factors, and any accompanying signs are obtained. Even when the patient and the doctor use the same terminology, a well-conducted interview with the patient helps to clarify and explain the characteristics of such symptoms. If the patient reports lightheadedness, vertigo, dizziness, or presyncope, the doctor should find out. Subjective motion, most typically the spinning sensation of one's environment, predominates in vertigo-type balance disorders. Symptoms include nausea, vomiting, or sudden sweating. It's important to distinguish vertigo-type balance disorders from other kinds like: dizziness, lightheadedness or presyncope. The findings by Tacikowska and Kubieczk Jagielska indicate that inner ear pathology accounts for 50% of balance disorders, neurological disorders account for 5%, orthostatic dizziness and drug side effects account for 5%, psychological and psychiatric causes account for 15%, and the etiology of vertigo and dizziness accounts for 25% is unknown¹. Anxiety disorders, Ménière's disease, acute vestibular neuritis or labyrinthitis, migraine and cervical migraine, and benign paroxysmal positional vertigo are the most prevalent causes of vertigo. A less frequent reasons are benign or malignant ear tumors, and vertebrobasilar ischemia. Differentiating between peripheral and central vertigo can typically be made as soon as the patient has had a clinical examination, allowing for the early diagnosis and subsequent therapeutic recommendations. The majority of vertigo patients can be effectively managed on a general practitioner level with only periodic otolaryngological management, negating the need for sophisticated clinical tests.

VESTIBULAR SYSTEM FUNCTION VERSUS VERTIGO

The cause of vertigo-like balance disorders is either acute unilateral vestibular malfunction of the peripheral character (vestibular receptors, vestibular nerve, and vestibular ganglion in the inner ear labyrinth) or central character (the cerebral cortex's vestibular field, the other nerve centers and vestibular pathways, and the brain stem's vestibular nuclei). It is different in cases of malignancies or long-term ototoxic drug poisoning. Vestibular system dysfunction develops gradually and can be bilateral or unilateral. Vertigo-like balance disorders are typically not caused by such situations, which instead cause progressively progressive, symmetrical, double-sided vestibular organ damage. Performing the Hallpike's technique during a patient's examination can help distinguish between peripheral and central origin of vertigo².

VERTIGO'S DIAGNOSTICS

Accurate diagnosis might be challenging because there are many potential causes of vertigo, especially in older people. The appropriate differential diagnosis will be made using the information gathered during the anamnesis (Table 1)³. Otoscopy and nystagmus findings should be part of the physical examination. Additionally, we should carry out simple neurological examinations known as cerebellar tests, such as the Unterberger's stepping test, the Romberg's test, and the fast alternating movements tests for dysmetria and dystaxia (dysdiadochokinesia). These tests can be static or dynamic and are used to evaluate the efficiency of posture and gait. The patient attempts Romberg's test by standing with their feet together and their upper limbs extended. Then the patient is seen to get unsteady, and the possible direction of occurrence is noted. The patient is requested to walk on the spot while keeping his eyes closed during Unterberger's test. This test should not be used to detect lesions without the support of additional tests, however if the patient rotates to one side, he may have vestibular dysfunction on that side. Measurements of blood pressure and pulse in horizontal, sitting, and standing positions should also be done (diagnostics of orthostatic hypotension). Hallpike's technique should be used to distinguish between peripheral and central vertigo. The patient's body is moved quickly during the examination, with his head in a "hanging" position that deviates by 10 degrees from vertical. This test makes someone with BPPV experience vertigo or nystagmus. The cause of vertigo may be peripherally located if vertigo and nystagmus manifest with a delay of 2–40 seconds, strong symptoms, and quick recovery after 60 seconds. Vertigo and nystagmus occur

immediately, are mildly intense, and last for more than a minute. These characteristics point to central disorders. Walking difficulties and evidence of neurological deficits other than balance abnormalities further support the diagnosis of central cause of vertigo. Tinnitus or hypoacusis refer to peripheral cause of vertigo.^{4,5}In situations like this, more extensive audiological diagnostic tests such as brain stem evoked response audiometry (BERA), otoacoustic emission, and pure tone and impedance audiometry should be carried out. These tests help to differentiate between various conditions (such as an acoustic neuroma) and locate the area of hearing impairment. The confirmation of the suspected acoustic neuroma must be achieved using magnetic resonance imaging (MRI). Additionally, magnetic resonance imaging (MRI) is the preferred technique for the diagnosis of multiple sclerosis, meningitis and brain inflammation, neurovascular contracts, and cervical spine disease.

In the event that there is middle or inner ear pathology (congenital, inflammatory, neoplastic, or trauma-related alterations), temporal bone CT scanning should be taken into consideration. The availability of otorhinolaryngological laboratories, which are capable of performing specific tests like Vestibular Myogenic Evoked Potentials (VEMP), Electronystagmography (ENG), and Videonystagmography (VNG), is currently becoming easier to get access. ENG is an objective study based

on recording of eye movements (nystagmus) by the use of corneo-retinal potential measurement. It consists of 3 basic steps: oculomotor evaluation, positional testing, and caloric stimulation of the vestibular system. It is possible to distinguish between peripheral (vestibular) and central balance abnormalities by comparing the outcomes of the study's subsequent phases. For further information thorough examination and evaluation of these eye movements using a sensitive, active infrared video camera, video nystagmography (VNG) is used to observe nystagmus.⁹Posturography is an objective Romberg test. By registering the movements of the body's Center of Gravity (COG), it assesses the vestibulo-spinal reflex. A person's compensatory postural motions while standing are reflected in their body's moving COG. Static posturography is performed by having the patient stand on a fixed, instrumented platform that is linked to sensitive detectors that can pick up on even the smallest body oscillations. A moveable horizontal platform on a specially designed apparatus is typically used to distinguish dynamic posturography from static posturography.⁶ Examining Vestibular Evoked Myogenic Potentials (VEMPs) is a novel method for evaluating vestibulo-spinal reflex. No extended latencies in VEMP or a poor response suggest a reflex arc course failure. Sometimes Meniere's disease, auditory neuromas, vestibular neuritis, and ototoxic vestibule damage are associated with an incorrect VEMP record.

Table 1: Vertigo diagnosis

Cause of vertigo	Duration of symptoms	Hearing disorders	Central/peripheral vertigo
BPPV	Seconds	no	peripheral
vestibular neuritis	Days	no	peripheral
Perilymph fistula	Seconds	yes	peripheral
Meniere's disease	Hours	yes	peripheral
Labyrinthitis concussion	Days	yes	peripheral
Labyrinthitis	Days	yes	peripheral
Acoustic neuroma	Months	yes	peripheral
Ischemic causes	Seconds hours	not usually	peripheral or central, depending on the place of ischemia
Migraine	Hours	no	central
Cerebellum's damage/tumor	Months	no	central
Multiple sclerosis	Months	no	central

VERTIGO TREATMENT

Pharmacotherapy

There is no perfect medication for treating vertigo or lightheadedness. Pharmacotherapy can treat both incidental and chronic vertigo, depending on whether it is symptomatic or causative. The only situations in which symptomatic therapy should be used are acute episodes of vertigo with vegetative symptoms (also known as the "vertigo shock phase"), in which case the patient usually needs to be hospitalized. First-generation neuroleptics, anxiolytics, and antihistamines are used to treat neurovegetative symptoms (e.g., nausea, vomiting, palpitations, sweating, and anxiety). These medications work on the structures in the medulla, the hypothalamus, and the limbic system. Neuroleptics include promazine (50 mg every 6-8 h IV or im), thiethylperazine (Torecan 6.5 mg every 8 hours IV, im, sc, or pr), and chlorpromazine (Fenactil 25–50 mg every 6 h them). These medications have an effect on the dopamine receptors (D2 receptor antagonists) in the cortex, limbic system, and hypothalamus, making them strong anxiolytics. They also have sedative and antiemetic properties. It is crucial to consider the potential for neuroleptic side effects, which can include convulsions, dyskinesia, cardiac arrhythmias, and hypotension. Therefore, it's critical to choose the medication's administration route wisely and to give careful thought to whether it's necessary, particularly for older patients.⁷⁻⁹ Benzodiazepines are the most widely used class of anxiolytics; these include diazepam (Relanium, Valium - 15-20 mg every 12 hours) and, in rare cases, midazolam (Dormicum), administered in collaboration with the anesthesiologist. It's important to keep in mind that memory problems and the potential for strong addiction are side effects. Anticholinergic activity of first-generation antihistamines inhibits effects on the central nervous system by blocking muscarinic receptors. Among these, when vestibular shock occurs, Promethazine (Diphergan 50 mg IV or im) is administered every 12 hours. Clemastine, hydroxyzine, and dimenhydrinate (Aviomarin) can be administered for mild vertigo and motion sickness.^{8,9} Prokinetics such as metoclopramide (MTC), which also blocks the Dopamine receptor (D2) in the central nervous system and has a sedative, antiemetic effect, can be used to treat the symptoms of acute vertigo. MTC also reduces nausea. Ondansetron (Atossa) is another antiemetic that blocks serotonin receptors in the central nervous system without having any sedative effects. It is also used as a treatment for vomiting during chemotherapy. The following medication groups are potentially used in the long-

term treatment of vertigo: alpha-blockers (nicergolina-Sermion), cytoprotective drugs, steroids, and diuretics; derivatives of methylxanthines (pentoxifylline- Trental, Polflin, Pentohehexal); derivatives of histamine (betahistine- Betaseric, Histigen, Polvertic, Lasvitina, Vestibo); alpha-blockers (nicergolina-Sermion); antiplatelet drugs; and extract of Ginkgo biloba.⁸ Nowadays, one of the drugs with the strongest track records for treating chronic vertigo is betahistine, which is comparatively safe. While betahistine does not significantly affect H2, it does stimulate weak postsynaptic H1 and block presynaptic histamine H3 receptors. It consequently causes the nerve terminals to release more histamine. It has a relaxing effect on the inner ear microcirculation's precapilar sphincters, which improves the stria vascularis blood flow of the labyrinth. It stops vestibular neurons from firing. The frequency and severity of vertigo and tinnitus are lessened with betahistine. It is authorized for the management of Meniere's illness. Additionally, it doesn't inhibit the compensation procedure.¹⁰ It is recommended to use for 2-3 months, 24 mg 2 times a day. Betahistine usage is only contraindicated in cases of pheochromocytoma. Patients with severe hypotension, gastric ulcers, and asthma should use this medication with caution. Acetylsalicylic acid (Aspirin, Acard, Polocard 75–150 mg/day), ticlopidine (Ticlo, Aclotin, Ifapidin 500 mg/day in 2 separate doses), or clopidogrel (Plavix, Areplex, Trombex 75 mg/day) are suggested antiplatelet therapies in the event of TIA. When a person with a history of TIA develops persistent vertebro-basilar circulation problems, 2–24 mg of betahistine should be administered daily. Other rarely used medications include funarizine and cinnaryzyna. Cytoprotective treatment is advised for chronic vertebro-basilar insufficiency. This includes trimetazidine (Metazydyna, Preductal, Cyto-Protectin), an extract of Ginkgo biloba (Bilobil, Ginkofar), and piracetam (Memotropil, Nootropil, Lucetam), a derivative of γ -aminobutyric acid (GABA), at a dose of 3 to 800 mg/day for eight weeks. cytoprotective medications should be provided carefully. When taken in the evening, piracetam makes it difficult to fall asleep. Convulsions, hyperkinesia, weight gain, and anxiety are its side effects. Trimetazidine may induce parkinsonian symptoms or exacerbate them. Other typical trimetazidine adverse effects include indigestion, diarrhea, and abdominal pain.^{8,9} When a patient has presbyastasia, or age-related vertigo, they should use a cane, kinesiotherapy, and, in certain situations, ginkgo biloba extract and betahistine therapy.⁹ Steroids are another class of medications that are administered to individuals with

vertigo; these medications are used to treat vestibular neuritis, multiple sclerosis, and occasionally Meniere's disease.⁶

MÉNIÈRE'S DISEASE

Three main symptoms of Ménière's disease (endolymphatic hydrops of labyrinth) are low frequency fluctuating hearing, tinnitus, and vertigo. loss and a sensation of ear fullness. In this illness, an imbalance between endolymph absorption, secretion, and incorrect composition causes the volume of endolymph to grow, which has the effect of distention of the labyrinth's membranes. Therapy ought to result in reduction in the pressure of the endolymph. Diminishment of vertigo symptoms, a low-salt diet (less than 1-2 teaspoons) can be used. Such treatment has a noticeably smaller effect on tinnitus and hearing loss.^{11,12} Of all the medication treatments for peripheral vestibular disorders, including Meniere's disease, In Europe, betahistine is the medication most commonly selected for dysfunction. After 40 years of clinical experience has shown that betahistine is effective in Ménière's illness. A significant therapeutic benefit of betahistine in comparison to several medicines used in this field are those that lack sedative qualities. maintains vestibular compensation is unaffected. The significance The importance of rehabilitation in this disease's treatment should not be overlooked. cite.¹⁰ Within the presumed immunological context of Meniere's illness (both sexes exhibiting symptoms), corticosteroids (prednisone in a 5-to 10-day oral dosage of 1 mg/kg/day).⁸

MIGRAINE ASSOCIATED VERTIGO (MAV)

Significant correlations between vertigo and migraine are revealed by epidemiological data. An accurate diagnosis of vertigo is important. because migraines that are properly treated resolve more quickly than following the use of other techniques.^{13,14} first MAV therapy is done in order to treat migraines. There are three primary components to Treatment for migraines: avoiding triggers, acute symptoms both pharmaceutical prevention and control. Suggestions must to involve altering one's diet, way of life, and vestibular exercising for rehabilitation and taking medication. Modifications in diet include cutting back on or giving up chocolate, caffeine, and aspartame and booze.

Early usage of medications such as ergotamine or triptans increases their effectiveness. Regular use of these drugs may lead to a condition known as medication overuse headache, when the headaches become both more severe and common. Preventative pharmacotherapy among the first line-β-blockers for

migraine attacks are metoprolol (50 mg/day), anticonvulsants (valproic acid, 100 mg/day), (Tapiracine 50–800 mg twice daily) and Depakine Chrono 500–800 mg 100 mg per day (beginning at 12.5 mg), as well as amitriptyline as a second-line Bisoprolol, naproxen, and venlafaxine.¹⁵ When treating vertigo that develops in between migraine bouts drugs of pain management and prophylaxis should be used. antivertiginosa category, such as funarizine or betahistine at recommended dosages.^{9,16}

PHYSIOLOGICAL VERTIGO

Vertigo due to Physiology The different information that reaches the vestibule, eyesight, and somatosensory receptors causes motion sickness. Some travellers who use various modes of transportation get motion sickness. transportation: automobile, ship, or aircraft in cases where conflicting information are provided to the visual organ, brain, and vegetative centres interfering with motion perception. prescription drugs for symptoms and The main factor is appropriate training, which includes habituation and adaptation. during therapy.¹⁷

PSYCHOGENIC VERTIGO

Depression, anxiety, and neuroses are frequently linked to vertigo. Psychiatrists and psychologists must treat these individuals. Instead of treating the peripheral cause of the vertigo each time, the underlying illness should be addressed.

EXERCISES OF VESTIBULAR REHABILITATION

Physical exercises have been used in vertigo rehabilitation for over 60 years. Resolution of vertigo and balance disorders in case of vestibular organ's damage depends on the equalization of bioelectrical activity between the two vestibules – the compensation process. As a result of vestibule's damage, there is a unilateral loss of impulse supply in the central nervous system or impulse distortion occurs. Compensation means inhibition of the excessive reactions of the unaffected vestibule and stimulating reactions on the side of the damaged one. Kinesitherapy by repetitive exercises leads to creating a new image of the vestibular situation in the central nervous system as a result of learning, gaining information and remembering.

BENIGN PAROXYSMAL POSITIONAL VERTIGO (BPPV)

This problem results from mechanical damage to the vestibular system rather than being a sign of insufficient vestibular compensation. inner ear organ called the otolithic organ. Usually, vertigo appears

while the The patient either tilts, bowed, or raised his head. Pieces of Otoliths collect in the posterior semicircular canal's arc. In some cases head placements, accumulation of such pieces due to gravity travel quickly inside the endolymph. This results in hydrodynamic drag. the cupula, distorting it and causing vertigo. pharmaceutical In this instance, therapy is not advised. Still, progress can be accomplished by having the patient turn their head so that the deposit movement via the non-cupular end of the vesti

EPLEY MANOEUVRE

The head of the patient is positioned in the typical Hallpike position, which involves a 45-degree spin and a small inclination backward. It results in otolith movement. pieces in the canal, relieving the patient's dizziness. The patient holds this posture for three minutes. After the patient's head this time is progressively turned ninety degrees in the direction of the other ear, such It makes a 45-degree angle with the plane vertical. Because of this, the Deposits enter the canal's non-cupular opening. After another After three minutes, the head and trunk spin even farther to the unaffected ear, causing the face to angle 135 degrees towards the floor. to the plane that is vertical.²⁰

The deposits pass through the canal's opening. The patient takes up a sitting position once more. The vestibule receives the deposits.²⁰ For the following few, the patient should stay in the seated position. hours to avoid the deposits being moved again. The existences stenosis of the carotid artery, ongoing ischemic heart disease, or restricted cervical spine mobility are regarded as a contraindication for this approach.²³ Maneuvring back into place is a useful strategy and simple to operate. The effectiveness of the Epley manoeuvre, as per the various sources, ranges from 50 and even 100 percent.²⁴⁻²⁶

MANAGEMENT

Surgical Management of DizzinessThe three types of surgery used to treat vertigo are outsource, neurosurgery, and angioplasty. Patients may need to have outsource. therapy when internal pathology raises worries about dizziness or/and middle ear structures, such as otosclerosis, fistulas, alterations that are inflammatory, traumatic, and proliferative, as well as in Meniere's illness. The treatment of auditory nerve tumours is dependent upon the tumour's size, the age, and the overall health of the sufferer. When geriatric adults with multiple comorbidities are significant operational risk, "wait and scan" is typically employed. When a patient has a tumour measuring greater than 3 centimetres in diameter.

Smaller tumours may be candidates for microsurgery. to be the most secure technique. Cerebellopontine angle, 3rd-by the middle cranial fossa in cases of small neuromas. Tese two last listed methods give the opportunity to save hearing.⁹

OTHER LESIONS

Other lesions such hematomas, tumours, vascular lesions, and cervical spine pathology (cervical spondylopathy) are treated with neurosurgery. Concerns about vascular surgery in specific instances of carotid disease.⁶The Meniere's illness symptoms continuing to exist Even with the previously specified medication, there is a sign for the purpose of surgery. Trans tympanic administration of tose is medications near the circular window (gentamicin, dexamethasone, lignocaine), repairing the tympanic cavity's ventilation drain for utilising Meniette Terapy-micropressure pressure equalisation system treatment), endoscopic sac surgery (decompression, incision),establishing a perilymphatic-endolymphatic fistula (PLF) or providing therapy resulting in surgical injury to the vestibular organ (selective vestibular chemically (aminoglycosides) or surgically (neurectomy, labyrinthectomy).

The primary determinant of the best approach is the degree of loss of hearing.^{6,27}

SUMMARY:

Many doctors still find it difficult to diagnose and treat vertigo. This paper reviews the literature that is currently available. Treatment guidelines for vertigo were described. It matters. should keep in mind the potential to stop vertigo episodes in a few patients. In most cases, rehabilitation should be advised. in abnormalities of balance, including central and Peripheral. A crucial element is a logical, meticulously prepared medication, steering clear of polypharmacy, tailored specifically for the patient. A patient's progress with balance issues after therapy does not absolve the physician of identifying the source of the symptoms. The necessity of multidisciplinary In complex situations of balance disorders, collaboration is emphasised.

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