Feeling unbalanced? Management of vertigo and Meniere's disease

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Abstract

Vertigo is defined as a condition whereby a sensation of spinning is experienced and can be accompanied by other symptoms like feeling weak or experiencing a loss of balance. Vertigo may be induced by drugs such as non-steroidal anti-inflammatory drugs, antidepressants and antihypertensives. Other causes of vertigo can include advanced age and the presence of several diseases. There are various types of vertigo namely: acute unilateral vestibulopathy, benign paroxysmal postural vertigo, central vertigo and functional dizziness. Vertigo has multiple treatment approaches which can be divided into pharmacological and non-pharmacological treatments including lifestyle modifications, trigger management, surgery, and medical devices. In terms of the management of Meniere's disease symptoms, betahistine remains the first-line agent due to its good tolerability and efficacy.

Keywords: Vertigo, dizziness, aetiology, vestibular, BPPV, Meniere's disease

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Introduction

Vertigo is a condition of abnormal sensations of movement perceived as spinning or swaying of a person's body.[1] Vertigo is considered a subtype of dizziness, and it is characterised by a feeling of weakness, faintness, or loss of balance.[2] In a population-based cohort study conducted at University Medical Centre in Germany reported that one in five people occasionally suffers vertigo.[1] The onset of vertigo has been noted around the age of between 40 and 60 years.[3,4] Despite this, the elderly population are more affected by vertigo.[5]

This prevalence amongst the elderly could be attributed to comorbidities and high medication use.[1] It increases the risk of falls, which predisposes to morbidity and mortality.[5] Females are more vulnerable to vertigo compared to males and this is more observed between the ages 55–65 years whilst males of the age group 65 and above show a higher prevalence than females.[1] Vertigo interferes with the ability of patients to perform their normal daily activities and subsequently affects their quality of life in daily living.[6]

Pathogenesis and aetiology

Medications may precipitate vertigo, and some of the common classes include anti-inflammatories such as nonsteroidal anti-inflammatory drugs, antidepressants such as selective serotonin reuptake inhibitors, and antihypertensives such as alpha blockers.[7] The decline in the physiological function of the vestibular system due to fewer vestibular hair cells and neurons with aging, may account for the prevalence of vertigo in the elderly population.[6] Vertigo may be caused by several diseases, which may be categorised as ontological vertigo/dizziness, central vertigo/dizziness or psychogenic vertigo/dizziness.[7]

The categories of vertigo

Acute Unilateral Vestibulopathy (AUV)

Acute Unilateral Vestibulopathy (AUV) is severe, continuous, and lasts a longer period with a sudden onset due to acute damage to the vestibular nerve or the labyrinth.[8] It is characterised by a sudden onset of vertigo, nausea, vomiting, gait instability and a tendency of falling.[7] AUV resolves spontaneously in most patients, but other patients may develop residual disorders, such as chronic dizziness, disequilibrium, spatial disorientation, and reduced ability to perform daily activities.[8]

Benign Paroxysmal Postural Vertigo (BPPV)

This is the most observed type of vertigo that may manifest as persistent brief episodes of vertigo.[2] It is thought to be due to the mechanical detachment of otolithic fragments from the utricular macula and their shift into one of the semicircular canals.[7] It is a form of positional vertigo that is not from any serious central nervous system origin, and it has a good prognosis.[9] Although BPPV is benign, if undiagnosed and untreated, it may interfere with quality of life and increase the risk of falls.[9]

Central vertigo/dizziness

Central vertigo originates from diseases affecting the CNS.[10] It "extends from vestibular nuclei in medulla oblongata to the ocular motor nuclei and integration system in mesencephalon to vestibulocerebellum, thalamus and vestibular cortex in temporoparietal and the neuronal pathway".[10] This includes vestibular migraine and vascular vertigo.[7] The HINTS test (head impulse, nystagmus, test of skew) shown on Figure 2 and a structured four-step bedside diagnostic algorithm named

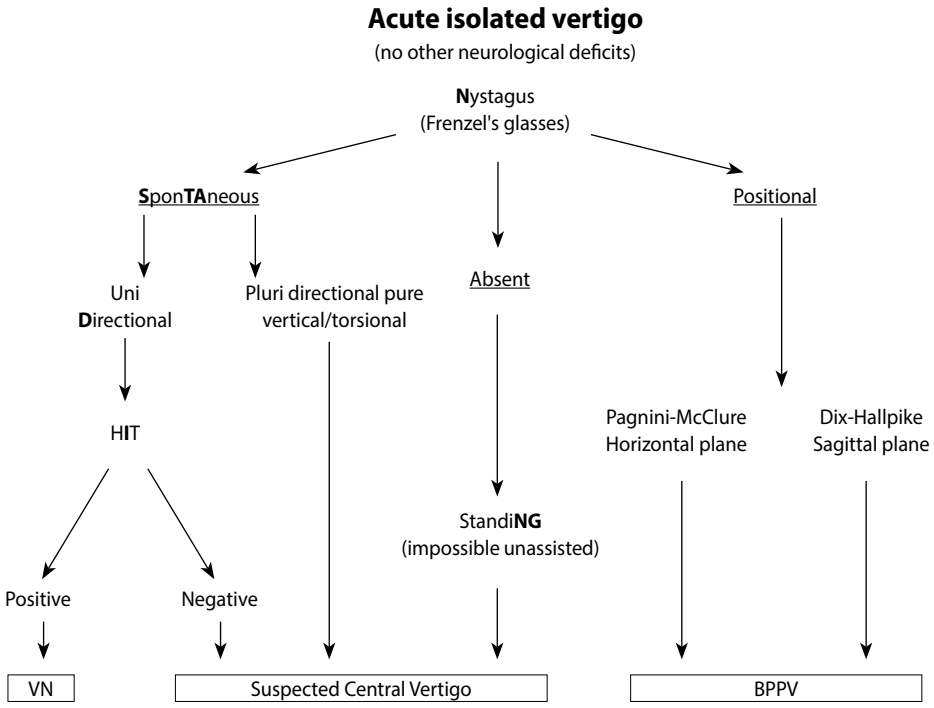


Figure 1: A diagram showing the vertigo STANDING diagnostic approach. VN-Vestibular neuronitis; HIT-head impulse test; BPPV-benign paroxysmal positional vertigo.[12]

STANDING on Figure 1 may be employed to distinguish central vertigo from differential diagnosis.[11]

Functional dizziness

It is also known as the persistent postural-perceptual dizziness (PPPD).[14] It is characterised by non-spinning vertigo and perceived unsteadiness that may be worsened when patients take upright postures and in situations with complex or moving visual stimuli.[15] The clinical presentation serves as the diagnostic tool.[7] Patients may experience chronic dizziness preceding vestibular diseases.[14]

Vertigo and Meniere's disease

Meniere's disease (MD) is a disease that affects the inner ear and is characterised by episodic vertigo, abnormal eye movement (nystagmus) with slow and fast components.[16] As per the Barany Society 2015 criteria for the diagnosis of MD, a patient must present with at least two spontaneous vertigo episodes, each lasting between twenty minutes and twelve hours for a definite diagnosis and two episodes of spontaneous vertigo episodes lasting twenty to twenty-four hours for probable MD.[16]

Special population at risk for Meniere's disease

In terms of risk factors for MD, allergies or allergic conditions like food allergies, allergic rhinitis and asthma have been implicated in some MD cases that have been reported.[17] Interestingly, a reverse correlation between allergies, MD and migraines was demonstrated as MD patients with migraines (71%) reported more allergies than those with just MD only (39%). This shows that there may be a link between allergies, MD and migraines.[17]

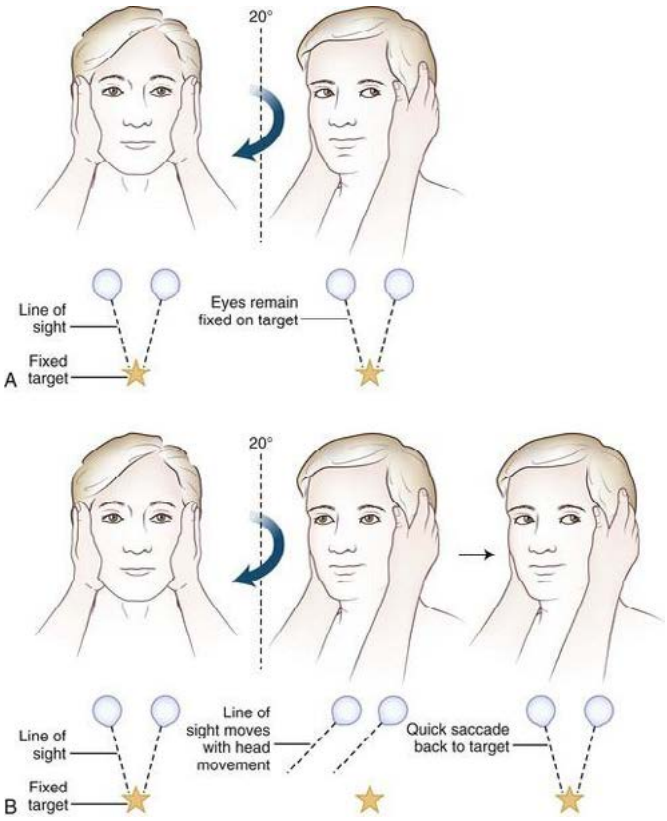
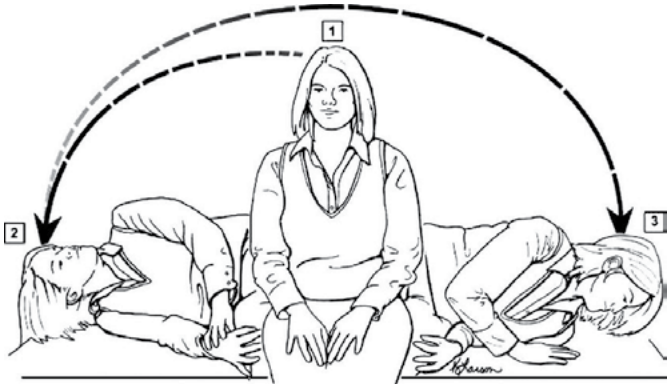


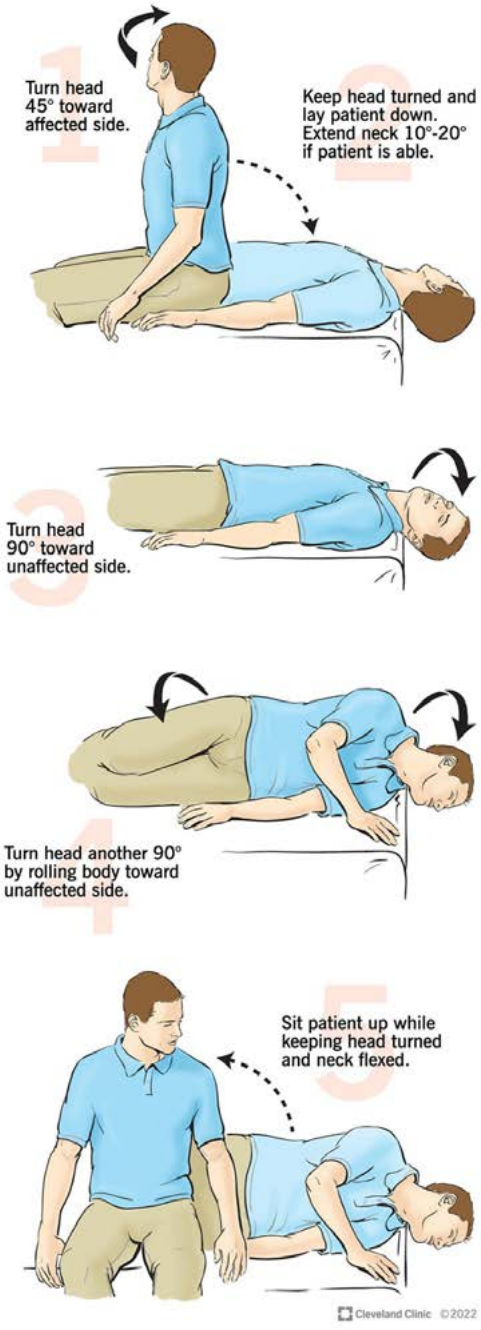
Figure 2: A diagram showing the HINTS diagnostic approach.[13]

Outline the treatments of Meniere's disease

MD has multiple approaches but all of them are aimed at controlling the vertigo experienced in MD. These approaches are divided into pharmacological and non-pharmacological treatments,



Canalith Repositioning Procedure (CRP)
Epley maneuver



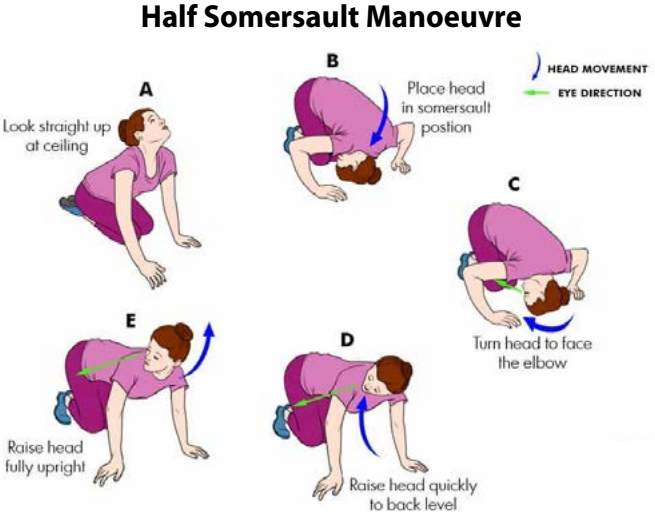


Figure 3: Repositioning Manoeuvres[30-33]

including lifestyle modifications, trigger management, surgery, medical devices and use of antivertigo drugs.[3,4,18,19] Antivertigo drugs include antihistamines like diphenhydramine, histamine analogues like betahistine, anticholinergics, benzodiazepines and diuretics, and other studies have noted improvement in MD patients with the use of steroids and intratympanic, gentamicin.[3,4,18,19]

Diuretics, like potassium sparing diuretics and hydrochlorothiazide are used owing to the mechanism of action of blocking sodium, potassium and chloride ion transporters in the kidney, which increases the release of water due to osmosis. This action normalises the pressure and volume in the endolymph, which helps decrease vertigo attacks experienced.[4,19] Betahistine dihydrochloride is the first line management of vertigo, particularly in MD and is dosed at 24–48 mg per day in two to three divided doses for this application.[18]

Diphenhydramine and other antihistamines are therapy options for vertigo whereby episodes last for a period of hours to days. For patients with MD specific symptoms like episodic vertigo, tinnitus and sensorineural hearing loss, Betahistine is used as it provides control of current symptoms when used for < 3 months and prevents future episodes when used for > 3 months.[20] Antihistamines inhibit the neuro-conduction in the vestibular nerve and nucleus via anticholinergic activity.[17] Steroids like dexamethasone (given as an intratympanic injection at a dose of 4 mg/mL) has been shown to be effective in the management of vertigo and was also found to improve tinnitus, hearing loss and fullness of the auricle. Although gentamicin is more vestibulotoxic than cochleotoxic and may also cause dizziness and unsteadiness, it is used in the management of vertigo, and it is administered as an intratympanic injection at a dose of 26.7 mg/ml.[19]

Mechanism of action of betahistine

Betahistine belongs to a class of histamines with strong antagonistic activity on histamine-3 receptors and weak agonistic activity on histamine-1 and histamine-2 receptors.[18,21] Betahistine exerts its effect in three main areas, namely the cochlea in the ear, nervous system and vestibular system. Firstly, betahistine and its metabolite, aminoethylpyridine, increases blood flow through the stria vascularis into the cochlea, while in the central nervous and vestibular system, it increases the synthesis, release, metabolism and elimination of histamine by blocking the H3 receptors, thus increasing its agonist activity on H1 receptors in the inner ear.[19,21,22] Lastly by acting on the H3 and H4 receptor, betahistine slows down the inputs going into the peripheral vestibular system.[21] By improving the circulation in the labyrinthine, it is believed to reduce Meniere's symptoms by restoring the balance between endolymph production and resorption.[21]

Safety of betahistine

Betahistine is generally well tolerated and has shown good efficacy, however, there is evidence of undesirable effects associated with its use. Patients experienced vertigo attacks, dry mouth and allergic reactions while on betahistine treatment.[23] Other adverse effects manifested as fatigue, abdominal pain, increased blood pressure and worsening of seborrheic dermatitis.[23] Other related adverse effects include headache, nausea and vomiting, dyspepsia and abdominal distension, which are usually mild to moderate and can be mitigated with dose adjustments.[24]

Non-pharmacological management:

Vertigo management does not solely involve pharmacological treatment but can include non-pharmacological approaches.[3,4,18,19] In terms of diet, this involves lowering salt intake, reducing consumption of caffeine and alcohol. Measures like trigger avoidance or management can also be used to manage vertigo. Surgical options like endolymphatic sac surgery, vestibular neurectomy and labyrinthectomy are available, although they have been associated with high rates of morbidities.[3,4,18,19] Other therapy options for the management involves the use of devices like the Menitte device.[19]

Vestibular rehabilitation has been documented as the mainstay of therapy for vertigo.[24] Vestibular rehabilitation therapy is defined as a physical therapy intended to treat and reduce symptoms caused by vestibular disorders.[25] Another solution is management with repositioning manoeuvres Figure 3 provided there is an accurate lateralisation and localisation of the involved semicircular canal.[26] The most common and performed repositioning manoeuvre is Epley manoeuvre (EM) however other therapeutic manoeuvres that aim to relieve vertigo symptoms include Semont, Brandt-Daroff and Half Somersault manoeuvres (HSM).[27,28] A study was conducted comparing therapeutic efficacy between the EM and Brandt-Daroff exercise where the two manoeuvres demonstrated an equivalent therapeutic effect in terms of improving BPPV. However, the study further reveals that neither of the manoeuvres manifested an immediate effect.[29]

In another study conducted comparing the effectiveness of EM, Semont manoeuvre and Brandt-Daroff, the results favoured the EM as it had a greater success rate.[34] A study focusing on the comparison of HSM and EM demonstrated substantial efficacy of both manoeuvres in the treatment of vertigo, however, the occurrence of residual dizziness post-treatment was higher with EM as compared to the HSM.[35] EM and Semont manoeuvre have both shown good resolution rate, however, EM produced better results in terms of post-treatment dizziness as compared to Semont manoeuvre.[36] The success rate of repositioning manoeuvres is comparable, however better outcomes are achieved when they are combined with vestibular rehabilitation exercises.[37]

Conclusion

Vertigo is classified simply as a type of dizziness, but it can negatively impact the quality of life of a patient if not adequately managed. Management may be particularly difficult, as symptoms of vertigo are often non-specific and can indicate various underlying causes. There is no superior treatment over the other as vertigo may be linked to many causes which adds to the

complexity to its management. This becomes more apparent in conditions like MD. Despite all the numerous treatment modalities available for the management of vertigo, betahistine remains a promising agent with good efficacy and tolerance.

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