

Special Article - Vertigo

Current Perspective: Vertigo in the Elderly

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Vertigo is a relatively complex condition demanding a skilfully collected and analyzed history. When an elderly patient presents with vertigo, some conditions are most commonly considered highly possible and likely whereas others (prevalent more in young) tend to be excluded from the mental algorithm of the clinician. It also matters to whom the patient presents first-internist, neurologist or the otolaryngologist. An important feature in vertigo in the elderly is the probability of it being multifactorial because of co-morbid conditions that could contribute to the complexity of manifestations. Conducting and appropriately interpreting the bedside tests/maneuvers and thereafter selecting battery of tests/investigations in a sequential manner can clinch the issue of a fair diagnosis in most cases. The Covid Dimension: Any discussion on vertigo would be incomplete without noting the findings on vertigo reported abundantly over the last one year. The compounding COVID angle merits being duly and appropriately considered.

Keywords: Vertigo; Elderly; Geriatrics; COVID0**Introduction**

With an enhanced life span and longevity, a population feature, an increasing number of persons may approach a doctor through telemedicine, referral, and direct consultation for dizziness. Dizziness and balance disorders in the older adult should be considered multifactorial, and can be extremely difficult to diagnose [1]. This symptom might range from 'acutely' distressing to 'tolerable', mostly on some prior medication. Vertigo and dizziness are not synonymous with each other. True vertigo implies an equilibrium disturbance associated with the dysfunction of either central or peripheral vestibular system. Individuals with vertigo usually complain of pure sensation of rotation or spinning. Dizziness on the other hand includes pre-syncope, light headedness, disequilibrium, and other disorders due to cardiovascular, neurologic or metabolic illness and true vertigo. The prevalence of dizziness increases steadily with age; 30% of people older than 65 years' experience dizziness in some form [2]. Further, older people with chronic dizziness or imbalance have two to three times propensity to fall in comparison with older people who do not experience these problems. The main causes of dizziness are divided into five main categories: a) Otologic (peripheral); b) Central; such as cerebrovascular stroke; c) Medical and toxic: Including low or high blood pressure, low blood sugar, infections and adverse effects of drugs and drug interactions; d) Psychogenic: hyperventilation associated with anxiety attacks and e) Unlocalized: The causes of peripheral vertigo mainly include Benign Paroxysmal Postural Vertigo, Meniere's disease, Vestibular Neuronitis, Cholesteatoma-labyrinthine fistula, Acute labyrinthitis, Herpes Zoster Oticus, Perilymphatic fistula, Acoustic Neuroma and superior semicircular canal dehiscence. Central causes include Cerebellopontine angle tumor, Cerebrovascular stroke, Multiple Sclerosis and Migraine. Other causes are cervical vertigo, drug induced vertigo and psychogenic vertigo.

According to the duration of symptoms of vertigo, the probable causes can be predicted as in Table 1.

If any one of the limbs of the tripod-of visual, vestibular or proprioception is affected it may result in imbalance or vertigo. The elderly are also prone particularly to cataracts, glaucoma, diabetic retinopathy, and macular degeneration, which affect vision; diabetic peripheral neuropathy, which affects position sense in the feet and legs; and degeneration of the vestibular system. Balance is also dependent on good muscle strength and joint mobility that are components of Frailty Syndrome prevalent in the elderly. The clue to the cause of vertigo usually lies in a skillfully consulted history, i.e. duration of attack of vertigo, its frequency, precipitating and relieving factors and presence of associated symptoms like hearing loss, headache, tinnitus, vomiting and focal neurological deficit [3].

Peripheral Vertigo**Positional vertigo can occur across all age groups**

Benign Paroxysmal Positional Vertigo (BPPV) is one of the most common vestibular disorders with an estimated lifetime prevalence of 2.4% [4]. It tends to affect individuals aged 50 to 70 years. With aging of world population, it is expected that societal burdens from BPPV will rise. This increase is a result of higher risk of falls with injury in the elderly that occur because of vertigo and postural instability. Symptoms of BPPV are almost always precipitated by a change in head position. Getting out of bed and rolling over in bed are two common "problem" motions BPPV is thought to be caused by calcium crystals (otoconia) that fall into posterior or lateral semicircular canals after detaching from ampulla of the utricle. This detaching and falling of otoconia can be secondary to trauma, infection, aging, vestibular neuritis and labyrinthitis [5]. Approximately 94% of these cases occur when the otoconia fall into the posterior semicircular canal and can be diagnosed with the Dix Hallpike manoeuvre [6]. Another 5 to 15% of these cases occur when the otoconia fall into the lateral semicircular canal [7]. These cases can be diagnosed with bilateral head turns in 30 degree head elevation from supine. BPPV is treated by particle repositioning manoeuvres. The Epley or Semont maneuvers are more complex and are better performed by experts/

Table 1: Duration of symptoms and causes of vertigo.

Duration of Episode	Causes of vertigo
A few seconds	Late stage of acute vestibular neuronitis, late stage of meniere's disease, vestibular paroxysmia
Few minutes	BPPV, perilymphatic fistula
Minutes to one hour	TIA, perilymphatic fistula
Hours	Meniere's disease, perilymphatic fistula from trauma, surgery, migraine, acoustic neuroma.
Days	Early acute vestibular neuronitis, stroke, migraine, multiple sclerosis.
Weeks	Psychogenic

specialists or vestibular rehabilitation therapists. For the posterior semicircular canal BPPV the treatment efficacy ranges from 53% to 99%, and increases by repeated particle repositioning manoeuvres [8]. After repositioning, postural restriction are advised to keep head elevated for 24 to 48 hours and avoid lying on the affected side for 5 days. For lateral semicircular canal BPPV, geotropic forms, the efficacy of canalolith repositioning manoeuvre could be 75 to 100% [9] and around 44% for apogeotropic BPPV. BPPV often responds to the Brandt-Daroff exercises performed over a three-week period. The elderly may be more affected by residual postural instability after successful BPPV treatment [10].

Meniere s Disease (MD)

Meniere s Disease (MD) also known as endolymphatic hydrops is disease of the inner ear characterized by a triad of symptoms: vestibular symptoms, auditory symptoms and ear fullness [11]. The cause of the disease may be progressive or non-progressive. Two variations of the disease have been identified: a) Cochlear Meniere's disease; b) vestibular meniere's disease. It is more common in adults with an average onset in fourth decade, symptoms beginning between 20 and 60 years. It is characterized by episodic vertigo, fluctuating hearing loss, aural pressure and tinnitus. Diagnosis is established by pure tone audiometry, caloric test, glycerol test, VEMP and electrocochleography. Medical management of MD includes a low salt diet, avoidance of caffeine derivatives and alcohol, diuretics, vasodilators, oral steroids and intratympanic injection of low- dose gentamycin or dexamethasone. Surgical options include mastoidectomy, endolymphatic sac decompression which in chosen cases delivers satisfactory results.

Vestibular neuronitis

Vestibular Neuronitis is characterized by acute onset of vertigo with associated nausea, vomiting and generalized imbalance. In one study, the peak age distribution for vestibular neuritis was between 30 and 50 years; furthermore approximately 12% of patients were over age 65 [12]. The typical onset is of intense vertigo and is often described on getting up in morning. There is a tendency to fall on the involved side and spontaneous nystagmus. Head or body movements invariably exacerbate the symptoms. The initial symptoms of vertigo tend to subside over a week or two. Residual imbalance might remain for months. BPPV is more common in patients who have suffered from vestibular neuritis. It has been suggested that utricular otoconia might be loosened with the initial neuritis [13]. Head thrust testing towards the affected ear will often demonstrate catch-up saccades indicating a peripheral vascular insult [14]. Head impulse test serves as a simple bedside test to reliably indicate unilateral peripheral

vestibular deficits [15]. It describes the result of having an examiner abruptly accelerate and then decelerate the head, moving the head in rapidly at high speed and stopping it.

In the acute phase of sudden rotatory vertigo the differentiation of peripheral versus central origin can be done by a five-step procedure [16]:

- Skew Deviation/vertical divergence.
- Gaze evoked nystagmus contralateral to spontaneous nystagmus.
- Saccadic smooth pursuits.
- Nonpathological head-impulse test in patients with acute nystagmus.
- Central fixation nystagmus.

This 5-step procedure yields a sensitivity of more than 95% for evidence of a central lesion that is more than MRI with diffusion-weighted sequences. "HINTS PLUS", includes pure tone audiometry in addition to this 5 points.

Migraine associated vertigo is vertigo and dizziness caused by migraine

Migraine associated vertigo and migraine headaches need not be simultaneous [17]. During MAV, 70% of patients have photophobia and 64% have sonophobia. A screening otologic and vestibular workup is desirable. Useful tests include audiometry and vestibular evoked myogenic potentials. Videonystagmography and brain imaging are required in selected cases.

Vertebrobasilar Insufficiency (VBI) can be distinguished from Migraine Associated Vertigo (MAV) based on history and lack of headache. Typical VBI patients are older and have multiple vascular risk factors. VBI, typically is sudden in onset and causes multiple cranial nerve symptoms (visual abnormalities, diplopia or oscillopsia, dizziness or dysphagia, and may culminate in frank syncope. The prognosis of MAV is similar to that of migraine. Identification of trigger factor is important and its avoidance crucial. Pharmacological treatment consists of anticonvulsant, antihypertensive or antidepressants. Other migraine abortive include the triptans, acetaminophen and aspirin; newer therapeutic vistas are opening up in migrainous disorders.

Acoustic neuroma

An acoustic neuroma (vestibular schwannoma) is a noncancerous (benign) growth on the vestibular nerve. Patients may present with episodic or positional vertigo, disequilibrium, tinnitus, and usually asymmetric hearing loss [18]. Early in the disease, when the tumor is small, patients complain of dizziness, hearing loss, and tinnitus, due to compression of the vestibulocochlear nerve. The slow growth often allows for central compensation, alleviating vertigo. With progressive growth, the tumor may press against the facial or trigeminal nerve causing facial weakness and numbness, respectively. Eventually, the tumor grows to a size where it compresses the brainstem and cerebellum causing truncal ataxia, dysmetria, disequilibrium, and possibly death. It is diagnosed by a battery of audiological tests and MR Imaging. Treatment options include surgical excision, radiation therapy, and observation with serial magnetic resonance imaging.

Vestibular paroxysmia or microvascular compression syndrome

Presents with a very disturbing first event consisting of extremely abrupt onset disequilibrium that lasts for a fraction of a second and then completely stops with no residual symptoms. It may also present with disturbing tinnitus.

In the diagnostic approach, the battery of audiological investigations comprising of Puretone Audiometry, Impedance Audiometry, SISI, Tone Decay test, Vestibular Evoked Myogenic Potential (VEMP), Caloric Test, Glycerol test and Videonystagmography can be employed selectively.

The etiology of peripheral vertigo may have regional differences:

In a study by Swain SK et al., it was noted that BPPV was seen in 38.38%, Migraine related 26.38%, Idiopathic vestibulopathy 9.72%, acute vestibular neuritis 6.94%, Meniere's in 5.55% of their study population [19].

Central Dizziness

Central dizziness is relatively less common than otologic dizziness but, as it is most often secondary to cerebro-vascular events involving the cerebellum and brainstem, it may be a warning sign of dangerous associated conditions. Common medical etiologies of dizziness mainly include elevated/ uncontrolled hypertension or hypotension and cardiac events, infection, low blood glucose, and medication. More often it presents as syncope. Cardiac dysrhythmias and acute myocardial infarction may also manifest as dizziness. Other neurologic disorders by disruption of the brainstem/cerebellar pathways may cause vertigo. Characteristics of Central vertigo include purely vertical or bilateral non-fatiguable nystagmus.

Cerebellar infarct

Dizziness is common in cerebellar infarct. It is usually associated with nausea, vomiting, unsteady gait and headache that is acute and severe. Insufficient examination and imaging can result in misdiagnosis. Cerebellar infarction with nausea, vomiting and dizziness mimics benign conditions such as labyrinthitis. Patients with central vertigo tend to be often distressed by ataxia, nausea, and illusions of motion for years.

Multiple white matter lesions (periventricular leukomalacia) are a common source of unsteadiness. Parkinsonism and related conditions also become much more common in older persons and can co-exist. Attacks of rotatory or postural vertigo lasting hours to several days, generally with additional brainstem deficits can be caused by infarction, hemorrhage or Multiple Sclerosis plaques in the brainstem. It is not uncommon for seizures to present as dizziness, epileptic vertigo deserves a special mention because it responds well to treatment with anticonvulsant medication. History suggests few brief attacks of spinning and may also have a history of loss of consciousness.

Sensory loss in the feet, due to diabetes mellitus, micronutrient deficiency or any other peripheral neuropathy may contribute to unsteadiness in the older population. Medications are a common contributor to dizziness and ataxia secondary to bilateral vestibulopathy. The elderly are often on multiple drugs, which places them at high risk for these side effects. The commonly implicated

drugs include anti-hypertensive, benzodiazepines, sedative hypnotics, anxiolytics and antiepileptic drugs.

Psychogenic dizziness includes spinning, tilting, levitating due to anxiety, depression or somatization disorder. Psychiatric dizziness includes phobic postural vertigo and chronic subjective dizziness.

“Unlocalised” dizziness is quite common and also includes hyperventilation syndrome, post-traumatic vertigo.

COVID-19 and Dizziness

When managing non-specific symptoms such as dizziness, clinicians need to remain vigilant, as it can be easily overlooked. Dizziness can either be a presenting feature of COVID-19 e.g. Acute Vestibular Neuronitis or as a delayed neurological presentation in long haulers. Pooled data from 24 studies estimate the prevalence of vertigo-7.25%, hearing loss-7.6% and tinnitus-14.8% in COVID-19 [20]. Dizziness was proposed to occur ensuing the neuroinvasive potential of SARS CoV2 [21]. It is postulated that virus enters the neural tissue from circulation and binds to ACE 2 receptors found in the capillary endothelium. Apart from direct invasion, hypoxia, hypercoagulopathy as well as immune mediated insult were among the postulated mechanisms of neuroinvasion, leading to dizziness [22].

In preliminary results of a study, 34 patients (18.4 percent) reported equilibrium disorder after Covid 19 diagnosis; 32 (94.1%) reported dizziness, and 2 (5.9%) acute vertigo attacks. Further, of total 14 (7.6%) patients reported both tinnitus and equilibrium disorder [23].

The elderly may represent a specific cluster of high risk patients for developing COVID-19 with rapidly progressive clinical deterioration. Immunosenescence and comorbidities are more likely to promote cytokine storm [24].

Medical Management

Symptomatic treatment for an acute attack of vertigo includes certain vestibular sedatives for a short period of three to five days. Prolonged use of vestibular suppressants can lead to bilateral vestibulopathy and may delay central compensation. Therapeutics is not covered at length; however drugs such as prochlorperazine, dimenhydrinate, cinnarazine, promethazine help to alleviate vertigo as well as symptoms like vomiting and headache. Other drugs used in recurrent and chronic vertigo are vasodilators like betahistine and piracetam.

Quality of Life and Fear of Falling

Many older people have a variety of adverse psychosocial difficulties related to falling, including fear, anxiety and loss of confidence. Treating the cause of vertigo, good communication with the patient, cognitive behavioural therapy and a good vestibular rehabilitation regimen can alleviate the fear of fall. Also the use of aids such as walking support sticks and other mechanized electrical devices and specialized soles could be encouraged. Virtual reality and internet based rehabilitation have shown promise in providing low cost, at home care for older adults suffering from dizziness and balance disorders [1]. Preventative screening guide for falls in elderly can also be used. These methods can drastically improve the quality

of life.

Summary

Dizziness in elderly tends to be multifactorial. Precise diagnosis may be elusive in some situations. Both the central and peripheral causes should be clearly understood, differentiated and treated accordingly. In the present pandemic, symptom of new onset dizziness or true rotatory vertigo necessitates testing for COVID-19.

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