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Age-Related Vestibular Disorders: Implications for Older Adult Patients

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The prevalence of dizziness and imbalance increases with age and as a result, these problems are common in older adults. Studies have shown that older adults who suffer from dizziness and imbalance are at higher risk of falling, and falls are the leading cause of hospital admission and accidental death among older adults.

Age-Related Vestibular Degeneration

Maintaining balance is a complex process involving rapid brain processing of input from the vestibular system located in the inner ear, the proprioceptive system, and vision, along with musculoskeletal coordination. While the causes of dizziness in older adults are multifactorial, vestibular degeneration is one of the most frequent contributors.

An important component of the balance system is the vestibulo-ocular reflex (VOR). When the head moves in one direction, the VOR causes the eyes to move equally but in the opposite direction so as to maintain gaze on an object. Gaze maintenance is important to reduce blurry vision during motion (called "retinal slip"). Reduced VOR function occurs with aging because of a decrease in hair-cell receptors and neurons in the vestibular end organs.

Common Vestibular Disorders in Older Adults

Table 1 lists the common vestibular disorders in older adults, along with their causes and symptoms.

Benign positional paroxysmal vertigo (BPPV) is the most common cause of vertigo across the lifespan, with an increased prevalence in older adults due to degenerative changes in the inner ear. In addition to age, osteoporosis and osteopenia are risk factors for BPPV.

Meniere's disease affects approximately 17% of older adults 61-70 years. While the exact cause of Meniere's disease remains unknown, it is likely related to an abnormal volume of endolymphatic fluid in the inner ear.

Vestibular neuritis accounts for 3-11% of patients seen in otology clinics because of dizziness. It occurs due to an inflammation of the vestibular nerve.

Exacerbating Factors

A number of conditions that are common in older adults can increase the fall risk associated with these common vestibular disorders. They include presbycusis, presbyopia, medication side effects, and cerebrovascular disease. Dizziness can also lead to fear of falling, which in turn can lead to sedentariness, and being sedentary decreases strength and balance and further exacerbates fall risk.

Diagnostic Evaluation

When taking a history from patients with dizziness or balance problems, note whether their symptoms are consistent with one of the common disorders in Table 1. Be alert for "red flags" that might indicate a serious neurological condition rather than one of those common vestibular disorders. Red flags include dysphagia, facial

Table 1. Common Vestibular Disorders in Older Adults

Disorder	Cause	Symptoms
Benign positional paroxysmal vertigo	Mobile calcium carbonate crystals (otoconia) dislodged from the utricle and mislocated in the semi-circular canals	Brief episodes of vertigo and dizziness lasting less than 1 minute and typically provoked by changes in head position. Diagnosis can be confirmed with Dix-Hallpike maneuver (Table 3).
Meniere's Disease	Overproduction or under-absorption of endolymphatic fluid from inner ear	Multiple episodes of vertigo (lasting 20 minutes to several hours), aural fullness, "roaring" tinnitus, and fluctuating hearing in the affected ear
Vestibular Neuritis	Inflammation of the balance portion of the 8th cranial nerve due to viral infection	Prolonged episodes of vertigo and dizziness lasting up to several days, typically without auditory symptoms

TIPS for Dealing with Vestibular Disorders in Older Adults

- Consider vestibular disorders as a cause of falls in older adults.
- Consider referral for a vestibular evaluation with an audiologist if a patient feels unsteady or dizzy, has a fear of falling, or has incurred a fall within the last year and the cause for the fall is not apparent.
- When patients have a diagnosed vestibular disorder, consider referral for vestibular rehabilitation therapy. It can accelerate compensation strategies to help patients recover and manage uncomfortable long-term symptoms.

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weakness or drooping, dysarthria, diplopia, drop attacks, and spontaneous nystagmus with an inability to suppress eye movements when fixating on a visual target. In older adults at fall risk in whom one of the common vestibular disorders is not apparent and in whom no red flags are present, consider referral for evaluation for vestibular dysfunction by an audiologist. Common tests an audiologist will perform are shown in Table 2.

Treatment

BPPV can often be successfully treated with Epley maneuver (see https://www.youtube.com/watch?v=jBzlD5nVQjk), which repositions the dislodged otoconia in the inner ear.

For Meniere's disease and vestibular neuritis, vestibular suppressants (i.e., meclizine) are often prescribed and can be effective for reducing the uncomfortable symptoms, but they should be used with caution in older adults because of their anticholinergic effect and because they impair the process by which the central nervous system adjusts to vestibular lesions over time - a process known as central compensation. For patients with BPPV, symptoms may persist until otoconia repositioning with the Epley maneuver is complete, even if vestibular suppressants are used.

While central nervous system compensation over time may improve a patient's symptoms, some dizziness and imbalance may persist. Patients with persistent symptoms may benefit from early referral for vestibular rehabilitation therapy (VRT).

VRT exercises can be completed in clinical settings and/or at home. Without VRT, patients may develop inappropriate ways to avoid bothersome symptoms, like becoming sedentary. VRT can accelerate good compensation strategies to help patients recover and manage uncomfortable long-term symptoms.

Research suggests that VRT is particularly effective for adults with unilateral vestibular impairment. Patients who underwent VRT in placebo-controlled trials reported more improvements in balance, walking, vision, dizziness, and ability to participate in daily activities. VRT also results in significant improvement in balance test scores, demonstrating VRT as a means to prevent falls - a primary concern for older adults with vestibular disorders.

Examples of some commonly used home VRT exercises can be viewed at https://www.youtube.com/watch?v=epJ1luFyF2o.

Table 2: Synopsis of Vestibular Tests

Test	*What It Tests For*	*Video Demonstrating Test*
Dix-Hallpike Maneuver	Used to confirm diagnosis of benign positional vertigo. While patient is seated, patient's head is turned 45° to the side and then patient is rapidly laid down with head hanging 30° over the end of the table. The test is repeated on the opposite side. Development of nystagmus after 20-60 seconds confirms diagnosis.	https://www.youtube.com/watch?v=8RYB2QIO1N4
Videonystagmography (VNG)	Measures oculomotor function and peripheral inner ear balance function by comparing responses from the left and right ear to air or water stimulation. Oculomotor function is measured by asking patients to follow targets presented on a light bar. When determining side of lesion, the VNG test is considered to be the "gold standard" for peripheral vestibular function.	https://www.youtube.com/watch?v=79lol892EPw
Sensory Organization Test (SOT)	Measures upright postural stability in different conditions that emphasize visual, proprioceptive, and vestibular cues. Failure of various conditions will generate a "pattern" suggesting possible areas of impairment.	https://www.youtube.com/watch?v=HT1xe4JaV7w
Vestibular Evoked Myogenic Potential (VEMP)	Measures integrity of inner ear reflex pathways in response to loud acoustic stimulus. Electrodes are used to record evoked potentials. VEMP testing can become less sensitive in detecting vestibular pathology as a function of age.	https://www.youtube.com/watch?v=CVS6LgwWcFk
Rotary Chair	Measures presence of bilateral inner ear dysfunction; however, side of lesion cannot be obtained with this test. The vestibular ocular reflex is measured while the patient is rotated.	https://www.youtube.com/watch?v=CCE5cEuHywU
Video Head Impulse Test (vHIT)	Measures the vestibular ocular reflex by detecting retinal slippage. Patients are asked to fixate on a visual stimulus while their head is rotated in various directions at different velocities. Information regarding side of lesion is obtained	https://www.youtube.com/watch?v=ZGY9UzYLKeY

References and Resources

Center for Disease Control: and Prevention http://www.cdc.gov/steadi/pdf/steadi_olderadultfactsheet-a.pdf provides useful facts and statistics.
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