Vestibular Disorders

Vestibular disorders are pathologies that can either directly or indirectly affect the vestibular system of the body. These disorders can have a variety of symptoms, with vertigo, dizziness, and loss of balance being among the most common and often have the most detrimental effect on a patient's well-being. Vestibular disorders are separated based on their location in the body and the structures they affect. Peripheral disorders primarily affect the inner ear and the vestibular nerve, whereas central vestibular disorders primarily affect the brainstem, cerebellum, and other pathways closely associated with the vestibular system within the brain.



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Peripheral Vestibular Disorders

Unilateral Vestibular Hypofunction

Unilateral-tan Hippo-functioning

Unilateral vestibular hypofunction, or UVH, is commonly caused by viral or bacterial infections of the inner ear. Common symptoms include nystagmus, acute vertigo, and impaired vestibular ocular reflex (VOR), which may lead to oscillopsia (unstable vision). Patients may also present with impaired gait and balance along with accompanied nausea. Aging, trauma to the ear, blood clots or vascular issues such as strokes, and negative reactions to medications can also cause UVH.

Vestibular Neuritis

Nerve-on-fire

Vestibular Neuritis is a common cause of vertigo, behind only BPPV. The condition is a result of degeneration of the vestibular nerve, normally affecting only one ear, with bilateral involvement being slightly less common. Patients often report severe vertigo of sudden onset, along with horizontal-rotary nystagmus and postural imbalances that direct toward the unaffected ear in cases of unilateral involvement. Hearing loss is uncommon. The age of onset is typically between 30 and 60, with men affected primarily in their 40s and women in their 60s. Patient history often includes viral infections, either respiratory or GI-related, days or weeks prior to the onset of symptoms. Most patients will return to normal function within six weeks, but impaired balance and vision (oscillopsia) during head movement may persist longer and require anti-nausea medications or vestibular depressants.

Labyrinthitis

Labyrinth-on-fire

Labyrinthitis (or Vestibular Labyrinthitis) involves inflammation of the membranous labyrinth within the inner ear, with patients often complaining of sudden hearing loss and tinnitus. Therapists may note decreased postural stability during standing or walking for patients, as well as vertigo and nystagmus. Most cases of Labyrinthitis stem from acute viral infections or trauma to the inner ear, with adults ages 40-70 being the most commonly afflicted. If the cause is a viral infection, then treatments will center on resolving the infection and then implementing physical therapy if medical interventions do not improve symptoms.

Vestibular Schwannoma (Acoustic Neuroma)

Swan-gnome

Vestibular Schwannomas, also called "acoustic neuromas," are slow-growing tumors that originate within the internal auditory canal from Schwann cells of cranial nerve VIII. In the early stages, patients may report vestibular symptoms such as vertigo, unilateral hearing loss, tinnitus, and ataxia that gradually worsens. As the tumor continues to grow, it may compress the brainstem, eventually resulting in diplopia, dysphagia, weakness, headaches, and even some degree of vision loss. Treatment often necessitates surgical removal of the tumor to prevent worsening symptoms, although this may permanently affect the function of the vestibular nerve post-surgery. In such instances, therapy centered around balance and habituation exercises may allow patients to overcome residual balance defects.

Bilateral Vestibular Hypofunction

Bi-ladder Hippo-functioning

Bilateral vestibular hypofunction, or BVH, describes a global decrease in the function of the vestibular system, causing patients to suffer blurred "bouncing" vision during head movement along with postural instability and dizziness. The end result is often a vestibular system that is severely diminished, with many patients avoiding exercise and movement in general due to the debilitating side effects. Therapeutic treatment of BVH typically involves gaze stabilization

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exercises to limit the visual disturbances during head movement and also training the somatosensory and visual systems to compensate for decreased activity of the vestibular system. BVH occurs as a side effect of the aging process but may also occur after acute infections, ototoxic medication usage, and as a side effect of autoimmune disorders.

Benign Paroxysmal Positional Vertigo

Benign-bunny Pear-oxysmal Positioned in a Vertigo-vortex

BPPV is one of the most common vestibular disorders (and the most common cause of vertigo) and is caused by calcium carbonate debris called octonia (or "ear rocks"), which originate in the utricle of the inner ear. These octonia become dislodged and, during head motions, can become stuck in the labyrinth of the inner ear, sending false signals to the brain and triggering dizziness and/or vertigo, amongst other symptoms.

Meniere's Disease

Mean-ears

Ménière's disease describes an inner ear disorder that typically presents as acute "attacks" that last 24 to 72 hours, causing a variety of symptoms such as nystagmus and rotational vertigo, causing additional symptoms such as nausea, vomiting, and postural imbalances. Many patients will also report fullness of the ears, along with hearing loss that may or may not be accompanied by tinnitus during these attacks. The mechanism of Ménière disease involves over-excitation of the inner ear due to excessive pressure due to the buildup of endolymphatic fluid. If Ménière's disease becomes chronic, then unilateral vestibular hypofunction (UVH) may result. Secondary UVH can be treated via physical therapy vestibular exercises; however, these exercises should be avoided until days after the attack. Medical management during acute attacks includes anti-nausea medications and vestibular suppressants.

Perilymphatic Fistula

Pear-lymph-lime Fist-tunnel

Perilymphatic fistulas (PLFs) occur when perilymph, the fluid responsible for acting as a liquid barrier between the oval membranes that separate the inner ear from the middle ear, leaks into the middle ear due to a tear in the membrane. These fistulas can occur as a result of blunt trauma to the head, loud noises, and major changes in intracranial pressure, which may occur through airline flights, weight lifting, and deep-sea diving. Objects piercing the membrane may also result in PLF. Most patients will experience some form of hearing loss accompanied by vertigo that may intensify with changes in elevation or sudden increases in intracranial pressure, such as during the lifting of heavy weights. Unless PLF causes some degree of vestibular hypofunction, at which point vestibular exercises can be performed, physical therapy is generally not recommended. Medical management will normally consist of bedrest, but surgical repair of the membrane may be performed as well.

Central Vestibular Disorders

Vertebrobasilar Insufficiency

Back-of-brain Ice-ischemia Bound by Vines

Vertebrobasilar insufficiency denotes a blockage to blood flow within the basilar artery, which feeds oxygen to the inner ear, brainstem, occipital lobes, and cerebellum. This blockage may occur through atherosclerosis, or plaque buildup, within the arteries over time, leading to a trans-ischemic attack (mini-stroke) or complete infarct. Loss of function to the aforementioned areas of the brain will lead to symptoms such as vertigo, impaired balance and coordination, visual disturbances, speech difficulties, and generalized weakness. Symptoms may be temporary or permanent, depending on the severity of the stroke.

Traumatic Head Injury

Trauma-spike Head Injury

Traumatic Head Injuries, also known as Traumatic Brain Injuries or TBIs, describe external force to the brain and its integral structures. This external force can be physical forces such as those in contact sports, falls, motor vehicle accidents, or as a result of penetration from a sharp object into the brain. Blast injuries from explosive devices may also trigger TBIs and are more common in military personnel. Damage from TBIs may result in elevated intracranial pressure, as well as a decrease in blood flow to the damaged areas and swelling in some areas of the brain. Vertigo, dizziness, nausea and vomiting, visual disturbances, and impaired balance are common symptoms of TBIs; however, the length of these symptoms can vary, with some symptoms becoming chronic due to the severity of the injury.

Vestibular Migraine

Mind-rain

Vestibular migraines, or "sick headaches," are an extremely common occurrence, often afflicting women in their 20s through 40s more than men. Dizziness with head pain that is described as pounding or throbbing is the most common symptom, with these symptoms increasing in severity sporadically. Light and sound sensitivity may also be observed in patients, in addition to nausea and vomiting, as well as impaired balance and coordination. Physical therapy interventions should focus on habituation, VOR, and gaze stabilization exercises to aid in the management of symptoms.

Brainstem & Cerebellar Conditions

Brain-stem and Cerebellum-bell

Brainstem and cerebellar conditions describe any disease or condition that can either directly or indirectly impact these two structures. Brain tumors, such as vestibular schwannomas, atrophy of the cerebellum due to degeneration, and CNS-afflicting diseases and behaviors, such as multiple sclerosis, vertebrobasilar insufficiency, and alcohol abuse, are examples of common conditions that can afflict the brainstem and cerebellum. Symptoms of dysfunction commonly include some degree of impaired movement and coordination, dizziness, nausea, and even respiratory issues in more extreme cases.

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