

by overlay of depression or anxiety. Post-head trauma vestibular migraine has also been described.⁷⁷ Although BPPV is most often idiopathic, in specific cases traumatic brain injury is associated with BPPV.⁹⁹

Neurologic Disorders. One of the key issues facing clinicians attempting to diagnose the etiology for vertigo is the differentiation between peripheral causes of vertigo (those causes arising from the ear or vestibular apparatus) and CNS causes of vertigo. Although at times this may be difficult, several clinical features may suggest a central cause of vertigo rather than BPPV.^{100,101} Nystagmus findings that more strongly suggest a neurologic cause for vertigo rather than a peripheral cause such as BPPV include downbeating nystagmus on the Dix-Hallpike maneuver (particularly without the torsional component and particularly if not modified or recovered by a positional maneuver), direction-changing nystagmus occurring without changes in head position (ie, periodic alternating nystagmus), gaze holding, direction-switching nystagmus (eg, beats to the right with right gaze and to the left with left gaze), or baseline nystagmus manifesting without provocative maneuvers (which also could be a manifestation of vestibular neuritis apart from a neurologic cause). Failure to respond to conservative management such as CRP or vestibular rehabilitation (VR) should raise concern that the underlying diagnosis may not be BPPV.¹⁰² Among the central causes of vertigo that should be distinguished from BPPV are vestibular migraine, brainstem and cerebellar stroke or transient ischemic attacks, and intracranial tumors or disorders, such as multiple sclerosis.

Vestibular migraine (or migraine-associated vertigo) is very common, with a lifetime prevalence of 3.2%,¹⁰³ and it may account for as many as 14% of cases of vertigo.⁹⁰ Diagnostic criteria include the following: (1) ≥ 5 episodes of vestibular symptoms lasting 5 minutes to 72 hours, (2) current or history of migraine according to International Headache Society Criteria, (3) ≥ 1 migraine symptoms during at least 50% of the dizzy episodes (migrainous headache, photophobia, phonophobia, visual or other aura), and (4) other causes ruled out by appropriate investigations.¹⁰⁴ It is distinguishable from BPPV by virtue of the diagnostic components enumerated above, which are not associated with classic BPPV. Furthermore, vestibular migraine would be characterized as a spontaneous episodic vestibular syndrome.

Brainstem stroke and cerebellar stroke are dangerous causes of vertigo.¹⁰⁵ In 1 series of 240 cerebellar strokes, 10% presented similar to a peripheral vestibular process.¹⁰⁶ The onset tends to be more sudden than with neuritis. Physical examination will often disclose other neurologic findings relating to the posterior circulation, such as dysarthria, dysmetria, dysphagia, or sensory or motor loss, or findings of a Horner's syndrome.¹⁰⁵

Another important cause of vertigo is posterior circulation transient ischemic attack.¹⁰⁷ A study of strokes (N = 1141 patients)—among which 24% were in posterior circulation—showed that patients with vertebrobasilar strokes had an odds ratio (OR) of 15 in terms of having had a posterior circulation

transient ischemic attack in the 90 days preceding the stroke.¹⁰⁸ Half of these attacks were isolated vertigo, and 8% of the patients with vertebrobasilar stroke had a transient ischemic attack of isolated vertigo. Because transient ischemic attacks generally last < 1 hour, most patients are asymptomatic on presentation; however, if they were to have symptoms and signs on presentation, they would be the same as those associated with vertebrobasilar stroke.

Intracranial tumors and other brainstem lesions may rarely present with a history and symptomatology similar to those of BPPV.¹⁰² One uncommon but important example is central paroxysmal positional vertigo, due to structural lesions (tumors, strokes, and multiple sclerosis plaques) generally in the cerebellar vermis or region of the fourth ventricle, which can closely mimic BPPV.^{102,109} Multiple sclerosis patients are more often female and will nearly always have other worrisome findings, such as central nystagmus patterns, internuclear ophthalmoplegia, and other abnormalities that localize to the CNS.¹¹⁰ Importantly, among patients with known multiple sclerosis, BPPV was found to be a more common cause of acute dizziness than a multiple sclerosis flare.¹¹¹

Other Disorders. Several other nonotologic and nonneurologic disorders may present similarly to BPPV. Patients with panic or anxiety disorders may complain of symptoms of light-headedness and dizziness. Although these symptoms are usually attributed to hyperventilation, other studies have shown high prevalence of vestibular dysfunction for these patients.^{112,113} Several medications—such as Mysoline, carbamazepine, phenytoin, sedatives, and antihypertensive and cardiovascular medications—may produce side effects of dizziness and/or vertigo and should be considered in the differential diagnosis.

Cervical vertigo has been described as vertigo arising in conjunction with degenerative cervical spine disease.¹¹⁴ Cervical vertigo may produce similar symptoms to BPPV due to proprioceptive abnormalities arising from cervical spine dysfunction.¹¹⁵ Symptoms of cervical vertigo may be triggered by rotation of the head relative to the body while in an upright posture (as opposed to vertigo triggered by changes in head position relative to gravity). Orthostatic (postural) hypotension also may produce episodic dizziness or vertigo. The symptoms, however, are provoked by moving from the supine or sitting to the upright position in distinction to the provocative positional changes of BPPV.

Although the differential diagnosis of BPPV is vast, most of these other disorders can be further distinguished from BPPV based on the responses to the Dix-Hallpike maneuver and the supine roll test. Clinicians should still remain alert for concurrent diagnoses accompanying BPPV, especially in patients with a mixed clinical presentation.

STATEMENT 2b. MODIFYING FACTORS: Clinicians should assess patients with BPPV for factors that modify management, including impaired mobility or balance, CNS disorders, a lack of home support, and/or increased risk for falling. *Recommendation based on observational and*