

CAUSES OF CN VIII SYMPTOMS AND MR FINDINGS

Lesions of CN VIII, the associated end organs, and the associated neural pathways in the brain may cause dizziness, vertigo, tinnitus, and hearing loss. In patients with isolated conductive hearing loss, if imaging is indicated, the study of choice is usually a temporal bone CT. In patients with other symptoms (either alone or in combination), if imaging is indicated, the study of choice is usually a brain MR without and with contrast, with routine brain sequences supplemented by thin slices centered at the porus acusticus. Because of this division, the differential diagnosis is divided into two sections: one for the differential diagnosis of isolated conductive hearing loss, and another for the differential diagnosis of other symptoms.

ISOLATED CONDUCTIVE HEARING LOSS

Conductive Hearing Loss	Isaacson & Vora	UpToDate	Porter	Kaspar	Labus & Kowalak	Goroll	Collected cases
EAC Cerumen	x	x	x	x		x	
EAC foreign body	x		x			x	
EAC infection (otitis externa)	x	x	x	x	x	x	
EAC exostosis	x	x	x	x		x	
EAC osteoma	x	x	x	x			
Perforated tympanic membrane	x	x	x	x	x	x	
Otitis media	x	x	x	x	x	x	1
Cholesteatoma	x	x		x	x		
Otosclerosis	x	x	x	x	x	x	
Glomus tumors	x	x		x	x	x	
Squamous cell carcinoma		x	x	x	x		
Psoriasis		x					
Congenital atresia ossicles		x		x		x	
Temporal bone trauma		x	x	x	x		

Cause	Clinical Features	Imaging Findings
EAC cerumen	Sudden painless loss of hearing	Soft tissue density in external auditory canal.
EAC foreign body	History of insertion.	Foreign body in external auditory canal.
EAC infection	Sudden painful loss of hearing; narrow canal with debris	Diffuse soft tissue swelling with narrowing of the external auditory canal.
Otosclerosis	Normal, mobile tympanic membrane	None.
Cholesteatoma	Retracted or perforated tympanic membrane, with chronic drainage	Mass in the middle ear, often destroying bone.
Congenital abnormality of the cochlea	Early onset of hearing loss.	Abnormal appearance of the cochlea.
Chronic otitis media	Normal canal with red, immobile tympanic membrane	Soft tissue density in the middle ear; bone erosion.
Middle ear effusion	Immobile tympanic membrane	Soft tissue density in the middle ear.
Glomus tumor	Reddish-blue pulsating mass behind intact tympanic membrane	Soft tissue density arising at the level of the jugular foramen with bone erosion.

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CN VIII SYMPTOMS OTHER THAN ISOLATED CONDUCTIVE HEARING LOSS

Dizziness and/or Vertigo	Goroll & Mulley	Porter	Labus & Kowalak	Eisenberg	Kasper	Gomella	Paulman	Seller	Wasson	Total	Collected Cases
Benign positional vertigo	x	x	x	x	x	x	x	x	x	9	
Anxiety	x	x	x	x		x	x	x	x	8	
CPA tumors ¹	x	x	x	x	x	x		x	x	8	5
Drugs – ototoxic	x	x	x	x	x	x	x		x	8	
Meniere’s disease	x	x	x	x	x	x		x	x	8	
Stroke/TIA	x	x	x	x	x	x	x	x		8	9
Labrinthitis (viral or bacterial)		x	x	x	x	x		x	x	7	
Multiple sclerosis	x	x	x	x	x	x				6	1
Brainstem hemorrhage		x	x		x	x			x	5	
Hypoglycemia	x	x			x	x		x		5	
Hypotension		x	x		x	x	x			5	
Anemia	x	x	x				x			4	
Cardiac arrhythmias		x				x	x	x		4	
Orthostatic hypotension			x			x		x	x	4	
Trauma		x	x	x		x				4	
Vestibular neuronitis	x	x	x			x				4	
Hypoxia	x				x	x				3	
Migraine		x				x			x	3	
Otitis media		x						x	x	3	
Autonomic insufficiency	x					x				2	
Carotid sinus hypersensitivity	x					x				2	
Depression	x					x				2	
Herpes Zoster (Ramsey-Hunt syndrome)		x	x							2	
Hypovolemia			x				x			2	
Psychosis	x	x								2	
Vasovagal reaction						x	x			2	
Cataract surgery	x									1	

¹ Vestibular schwannomas, meningiomas, epidermoids, mets

Cervical spondylosis	x									1	
Chronic motion sickness		x								1	
Critical aortic stenosis	x									1	
Diabetes	x									1	
Diminished vascular reflexes of elderly	x									1	
Dissection – vertebral artery		x								1	
Emphysema			x							1	
Hypertension			x							1	
Hypocapnia and hypercapnia	x									1	
Menstruation		x								1	
Pregnancy		x								1	
Seizures			x							1	

Sensorineural Hearing Loss	Goroll & Mulley		Labus & Kowalak	Eisenberg	Harrison	Total	Collected Cases
		Porter					
Acoustic neuroma	x	x	x	x	x	5	5
Drugs	x	x	x	x	x	5	
Trauma – perilymph leak	x	x	x	x	x	5	
Meniere’s disease	x	x	x		x	4	
Multiple sclerosis	x	x		x	x	4	
Noise-induced deafness	x	x			x	3	
Presbycusis	x	x			x	3	
Diabetes	x			x		2	
Hyperthyroidism	x			x		2	
Labrynthitis		x			x	2	
Meningioma or other brainstem tumor		x		x		2	
Meningitis		x		x		2	
SLE		x		x		2	
Dehiscent tegmen							1

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Cause	Clinical Features	Imaging Findings
Vestibular neuritis	Vertigo without associated innitus/deafness. Largely a diagnosis of exclusion. No neurologic signs/symptoms or risk factors for cerebrovascular disease.	Contrast enhancement of the labyrinth or vestibular nerves
Migrainous vertigo	Vertigo without associated innitus/deafness. Known migraine headaches. Photophobia, sonophobia.	None or nonspecific scattered FLAIR/T2 hyperintensities.
Semicircular canal dehiscence	Vertigo provoked by coughing, sneezing, Valsalva, or loud sounds, without associated tinnitus/deafness.	Absence of bone overlying the superior semicircular canal
Otitis media	Vertigo with tinnitus/deafness and a normal neurologic exam. Unilateral ear pain, drainage, elevated WBC.	Opacified mastoid air cells; fluid in the middle ear.
Multiple sclerosis	Multiple (neurologic) lesions in time and space.	See MacDonald criteria for diagnosis.
Vertebrobasilar distribution ischemia	Risk factors such as hypertension, diabetes, smoking, or known vascular disease. Neurologic findings such as diplopia, dysarthria, dysphagia, weakness, numbness.	TIA: none. Stroke: MRI (+) DWI acutely, followed by (+) T2, FLAIR and then (much later) (+) T1
Meniere disease	Episodic severe vertigo lasting minutes to hours associated with unilateral tinnitus, hearing loss, and ear fullness.	Controversial; asymmetry of vestibular aqueduct.
Vestibular schwannoma	Slow growth of the tumor usually leads to minimal vertigo and patients usually come for evaluation of hearing loss and/or tinnitus	Mass at the cerebellopontine angle or, more rarely, within the internal auditory canal. With longstanding tumors, there may be erosion/widening of the canal.
Brainstem tumor	Sensorineural hearing loss with or without symptoms from compression of adjacent cranial nerves; history of primary (if metastatic).	Intra-axial or extra-axial brainstem mass.
Meningitis	Headache, fever, abnormal CBC and/or ESR. Abnormal spinal tap.	Abnormal contrast enhancement of the meninges, with or without nodularity.
CONDITIONS WITH NO IMAGING FINDINGS ON BRAIN MR		
Benign paroxysmal positional vertigo, drug toxicity (e.g. cisplatin, aminoglycosides, phenytoin), noise-induced deafness, presbycusis, diabetes, hyperthyroidism,		
ABBREVIATIONS		
CBC = complete blood count; CT = computed tomography; ESR = erythrocyte sedimentation rate; MR = magnetic resonance; SI = signal intensity; XR = radiography; US = ultrasound		