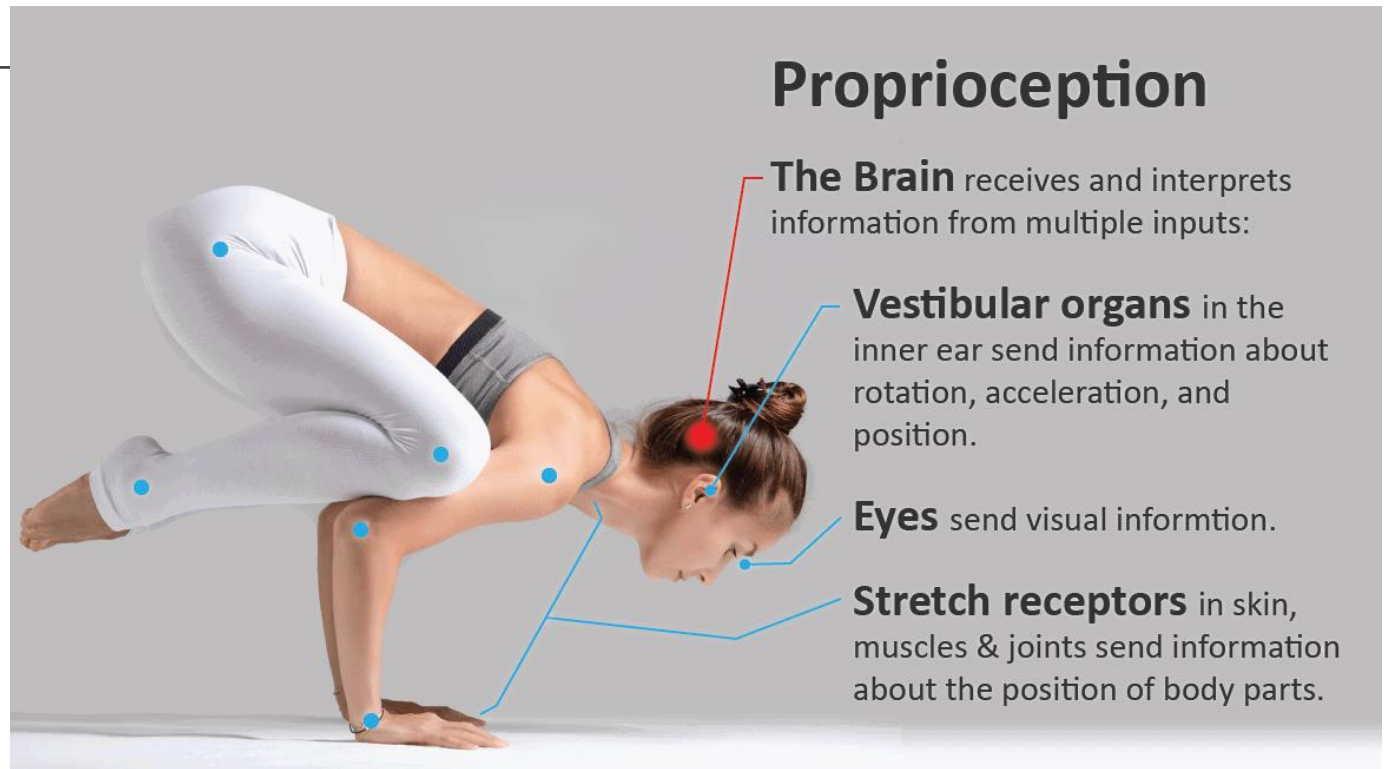




Neurology II-3

Vertigo, Ataxia

Equilibrium is the ability to maintain orientation of the body and its parts in relation to external space. It depends on continuous visual, labyrinthine, and proprioceptive somatosensory input and its integration in the brainstem and cerebellum.



VERTIGO

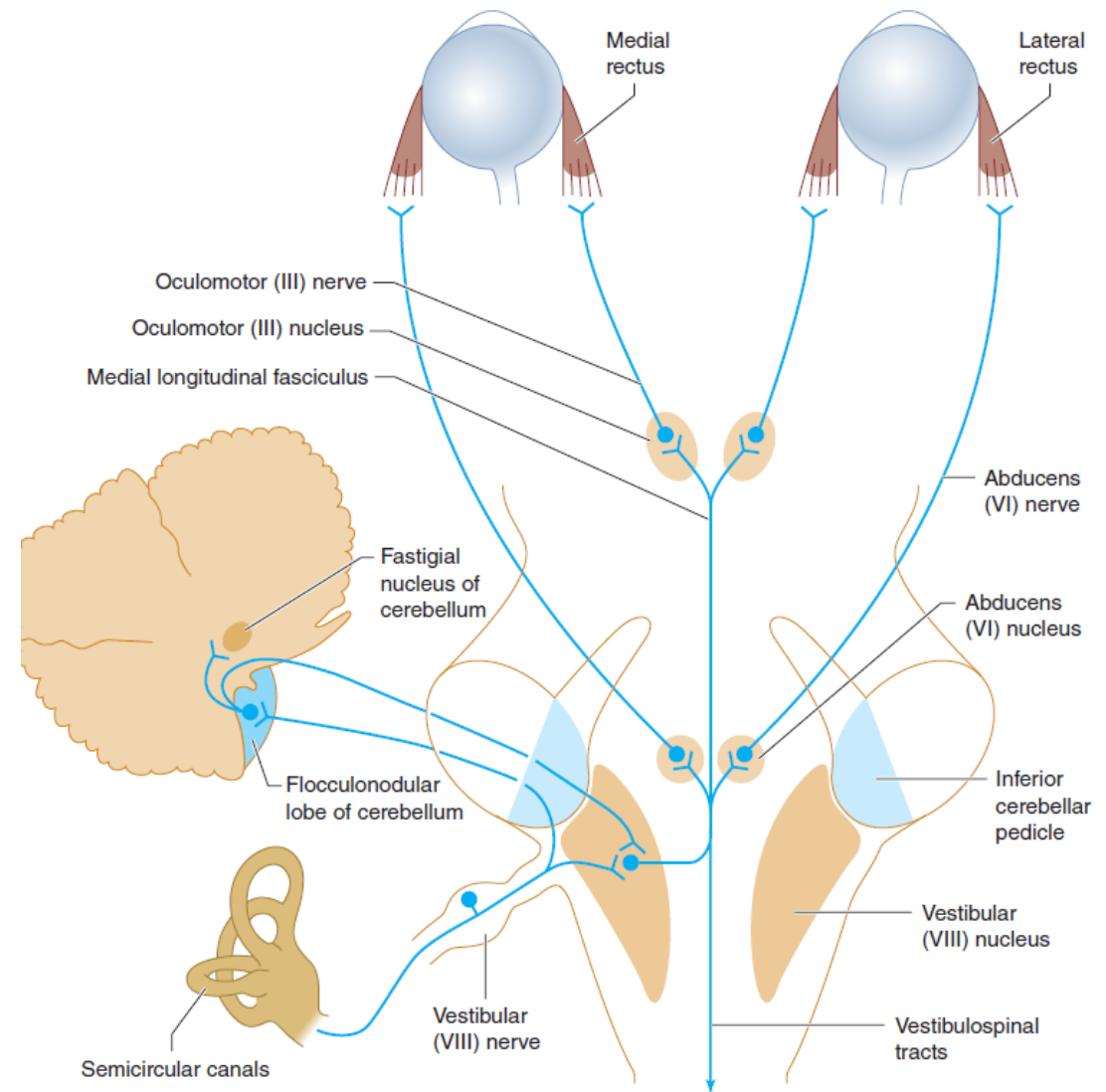
Vertigo is the illusion of movement of the body or the environment.

It may be associated with other symptoms, such as **impulsion**, **oscillopsia**, nausea, vomiting, or gait ataxia.

Vertigo must be distinguished from nonvertiginous **dizziness**, which includes sensations of light-headedness, faintness, or giddiness not associated with an illusion of movement.

The first step in the differential diagnosis of vertigo is to localize the pathologic process to the peripheral or central vestibular pathways.

Peripheral and central vestibular pathways.



Characteristics of Peripheral and Central Vertigo.

	Peripheral	Central
Vertigo	Often intermittent; severe	Often constant; usually less severe
Nystagmus	Always present; unidirectional, never vertical	May be absent; uni- or bidirectional, may be vertical
Hearing loss or tinnitus	Often present	Rarely present
Intrinsic brainstem or cerebellar signs ¹	Absent	Typically present

PERIPHERAL VERTIGO

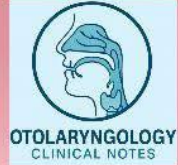
Peripheral vestibular lesions affect the **labyrinth** of the inner ear or the vestibular division of the **vestibulocochlear(VIII) nerve**. Vertigo from peripheral lesions tends to be intermittent, lasts for briefer periods, and produces more distress than vertigo of central origin.

Nystagmus

Hearing loss

Tinnitus

Peripheral vs Central Vertigo



PERIPHERAL VERTIGO



- Labyrinth or Vestibular Nerve Lesion
- Sudden, Severe Vertigo
- Hearing Loss & Tinnitus
- Horizontal/Rotatory Nystagmus
- Fatiguable, With Latency
- No Neurological Deficits

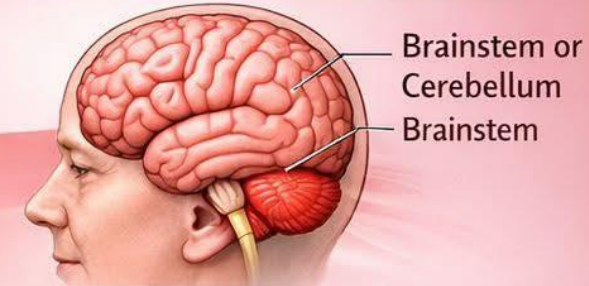
Examples:

- ▶ Ménière's Disease
- ▶ BPPV
- ▶ Vestibular Neuronitis



Peripheral: Severe vertigo, ear symptoms

CENTRAL VERTIGO



- Brainstem or Cerebellum Lesion
- Mild to Moderate Vertigo
- No Hearing Loss (Usually)
- Vertical/Direction-Changing Nystagmus
- Non-Fatiguable, No Latency
- Neurological Signs (Ataxia, Diplopia)

Examples:

- ▶ Cerebellar Disease
- ▶ Multiple Sclerosis
- ▶ Vertebrobasilar Insufficiency



Central: Neurological signs, vertical nystagmus

CENTRAL VERTIGO

Vertigo of central nervous system origin usually results from lesions that affect the brainstem **vestibular nuclei** or their connections.

Motor or sensory deficits

Hyperreflexia

Extensor plantar responses

Dysarthria

Limb ataxia

ATAXIA

Ataxia is incoordination or clumsiness of movement that is not the result of muscle weakness.

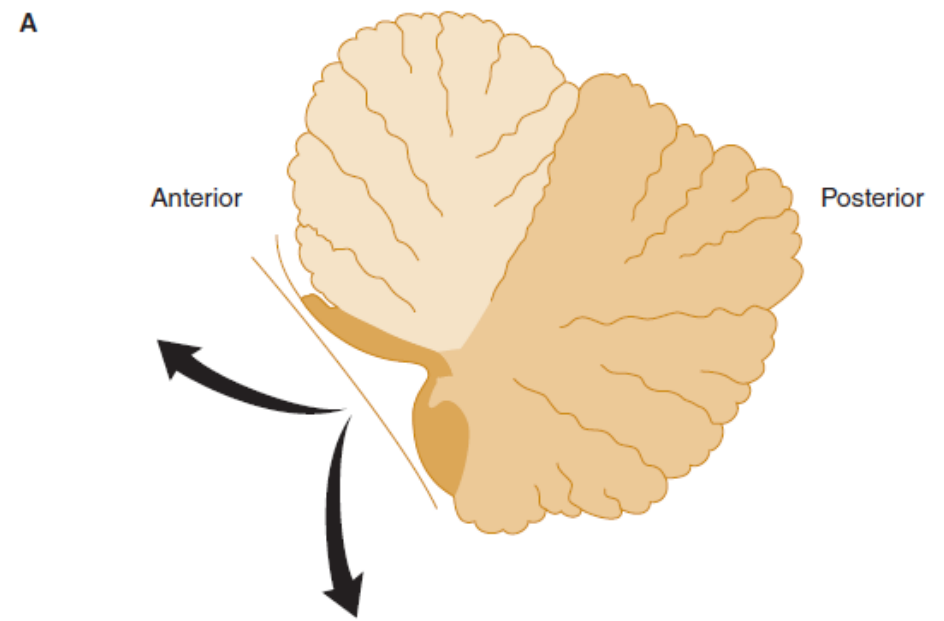
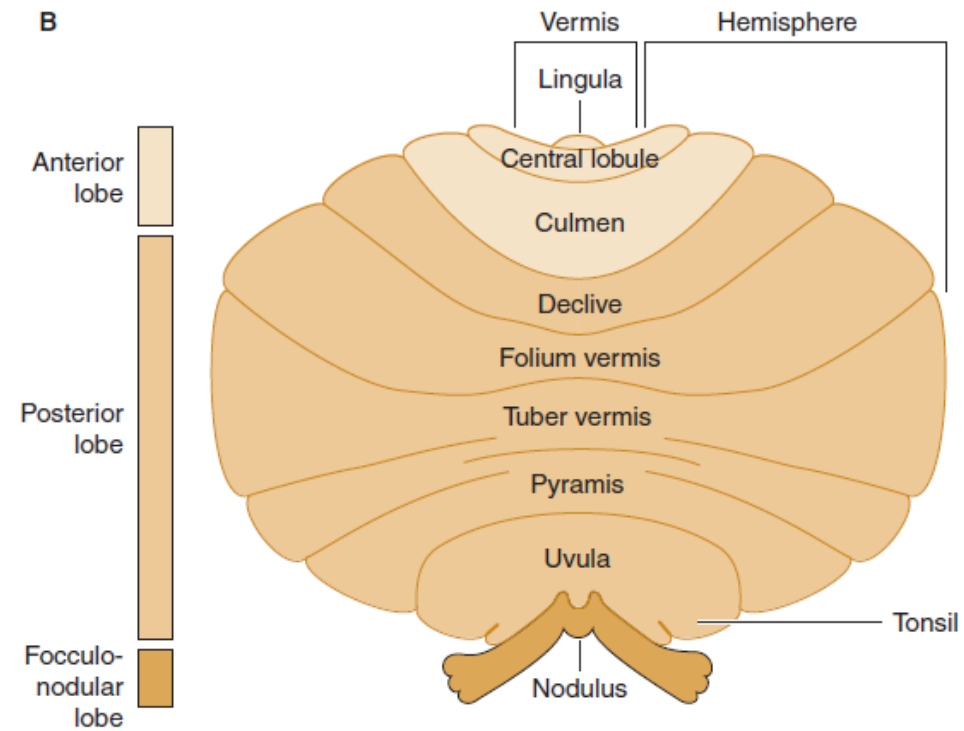
It can be caused by vestibular, cerebellar, or sensory (proprioceptive) disorders. Ataxia can affect eye movement, speech (producing dysarthria), individual limbs, the trunk, stance, or gait.



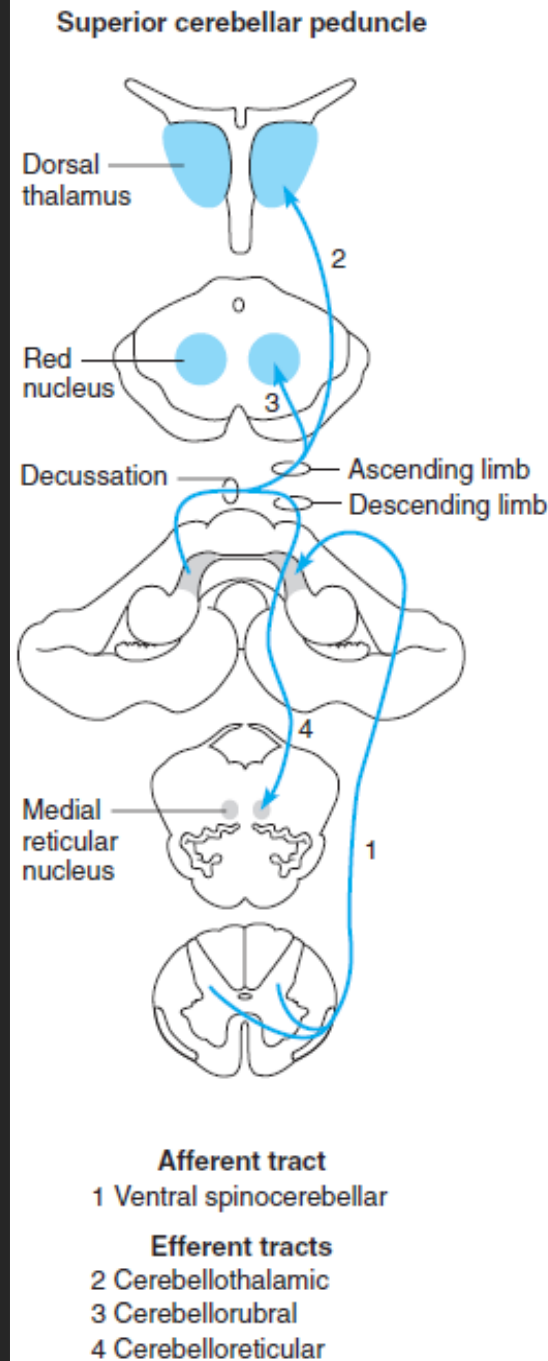
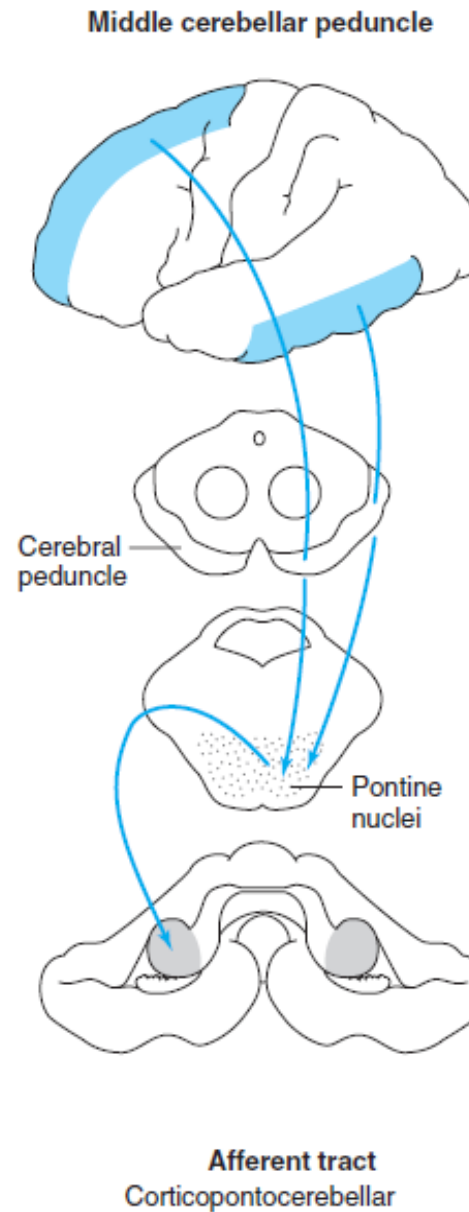
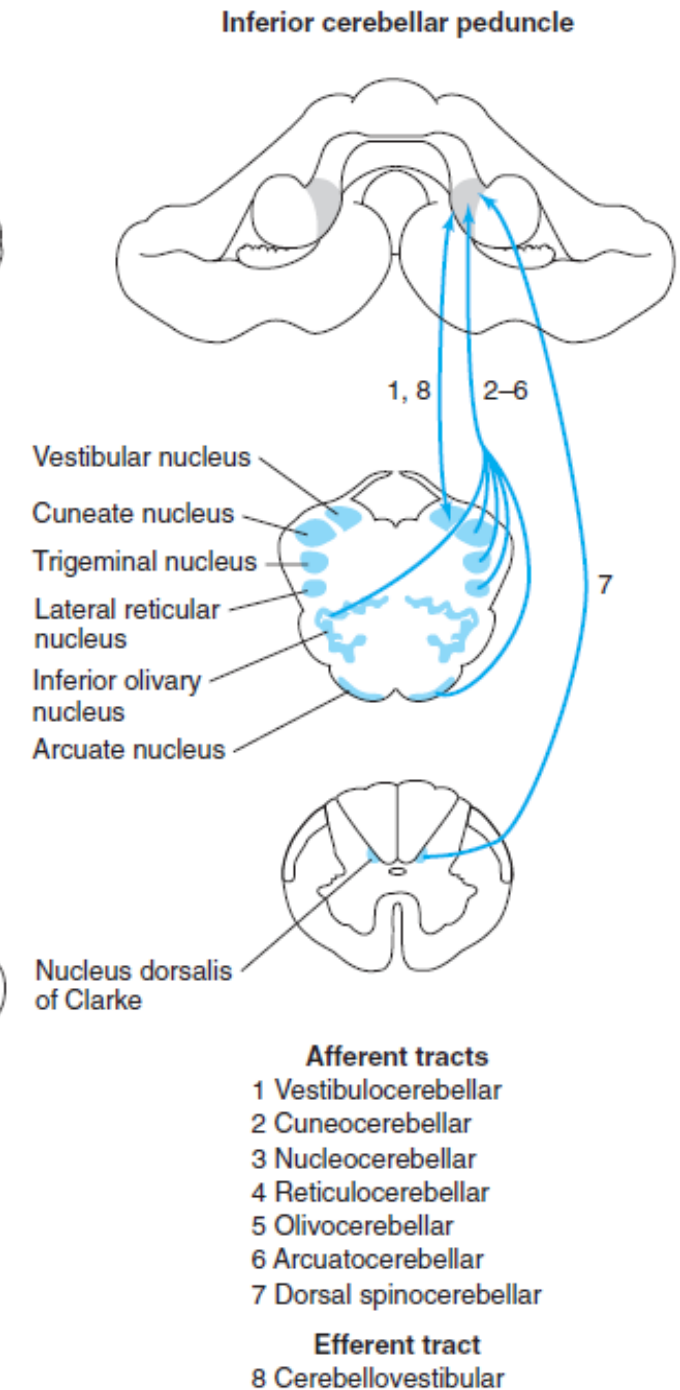
	Vestibular	Cerebellar	Sensory
Vertigo	Present	May be present	Absent
Nystagmus	Present	Often present	Absent
Dysarthria	Absent	May be present	Absent
Limb ataxia	Absent	Usually present (one limb, unilateral, legs only, or all limbs)	Present (typically legs)
Stance	May be able to stand with feet together; typically worse with eyes closed	Unable to stand with feet together and eyes either open or closed	Often able to stand with feet together and eyes open but not with eyes closed (Romberg sign)
Vibration and position sense	Normal	Normal	Impaired
Ankle reflexes	Normal	Normal	Depressed or absent

Characteristics of Vestibular, Cerebellar, and Sensory Ataxia.

Anatomic divisions of the cerebellum in midsagittal view (A), or unfolded (arrows) and viewed from behind (B).



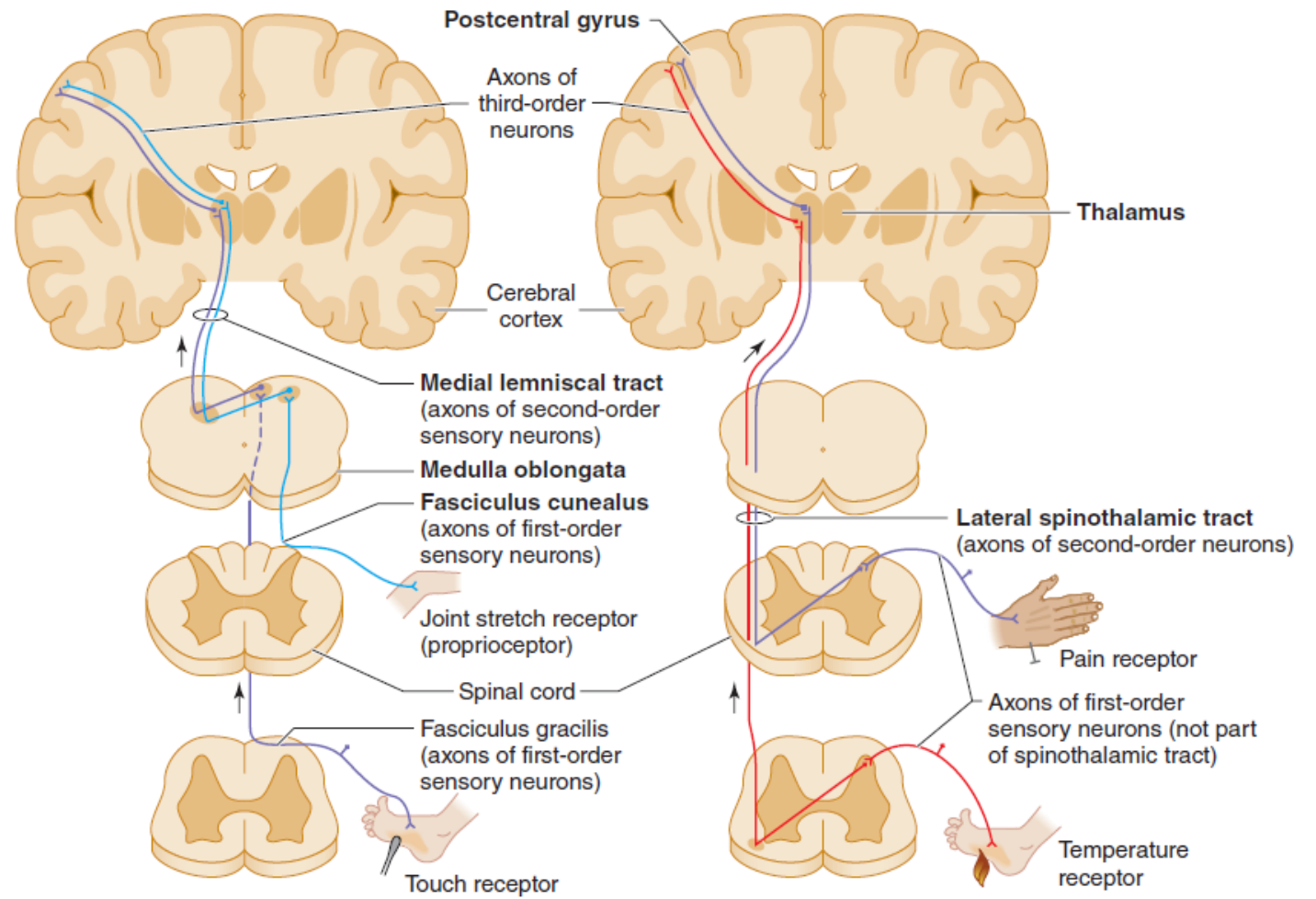
Cerebellar connections in the superior, middle, and inferior cerebellar peduncles.



Pattern of Involvement	Signs	Causes
Midline	Nystagmus, dysarthria, head and trunk titubation, gait ataxia	Tumor, multiple sclerosis
Superior vermis	Gait ataxia	Wernicke encephalopathy, alcoholic cerebellar degeneration, tumor, multiple sclerosis
Cerebellar hemisphere	Nystagmus, ipsilateral gaze paresis, dysarthria, ipsilateral hypotonia, ipsilateral limb ataxia, gait ataxia, falling to side of lesion	Infarction, hemorrhage, tumor, multiple sclerosis
Pancerebellar	Nystagmus, bilateral gaze paresis, dysarthria, bilateral hypotonia, bilateral limb ataxia, gait ataxia	Sedative drug intoxication, hypothyroidism, autosomal dominant spinocerebellar ataxias, paraneoplastic cerebellar degeneration, Wilson disease, infectious and parainfectious encephalomyelitis, Creutzfeldt-Jakob disease, multiple sclerosis

Clinical Patterns of Cerebellar Ataxia.

Pathways mediating proprioception (left, light blue) and other somatic sensory modalities (left and right).



HISTORY

SYMPTOMS & SIGNS

ONSET & TIME COURSE

MEDICAL HISTORY

FAMILY HISTORY

GENERAL PHYSICAL EXAMINATION

Orthostatic hypotension

Skin

Pigmented corneal

Skeletal abnormalities

NEUROLOGIC EXAMINATION

MENTAL STATUS EXAMINATION

STANCE & GAIT

CRANIAL NERVES

MOTOR SYSTEM

SENSORY SYSTEM

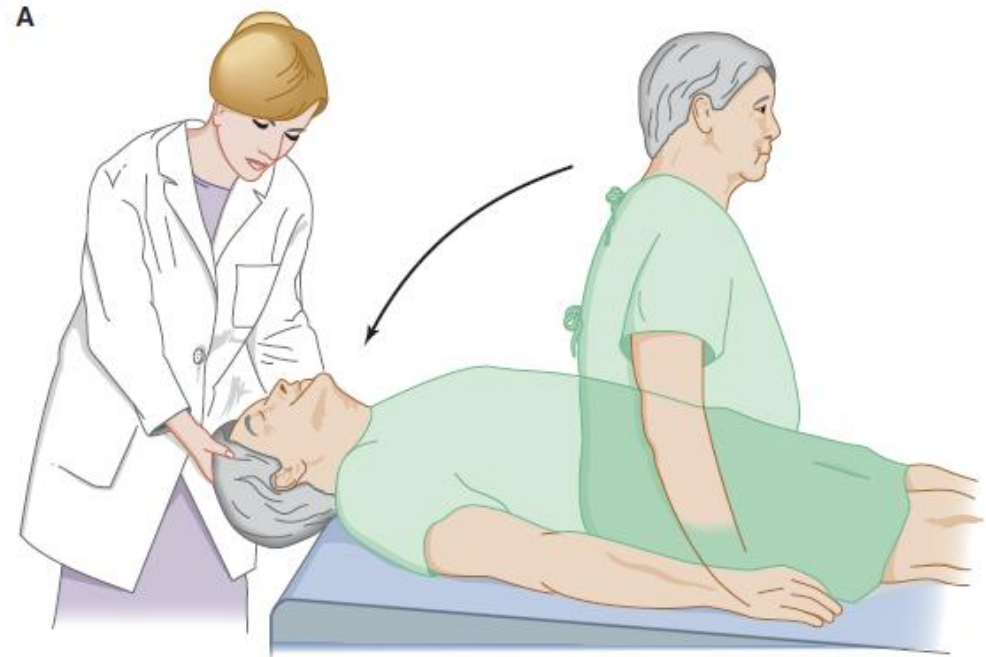
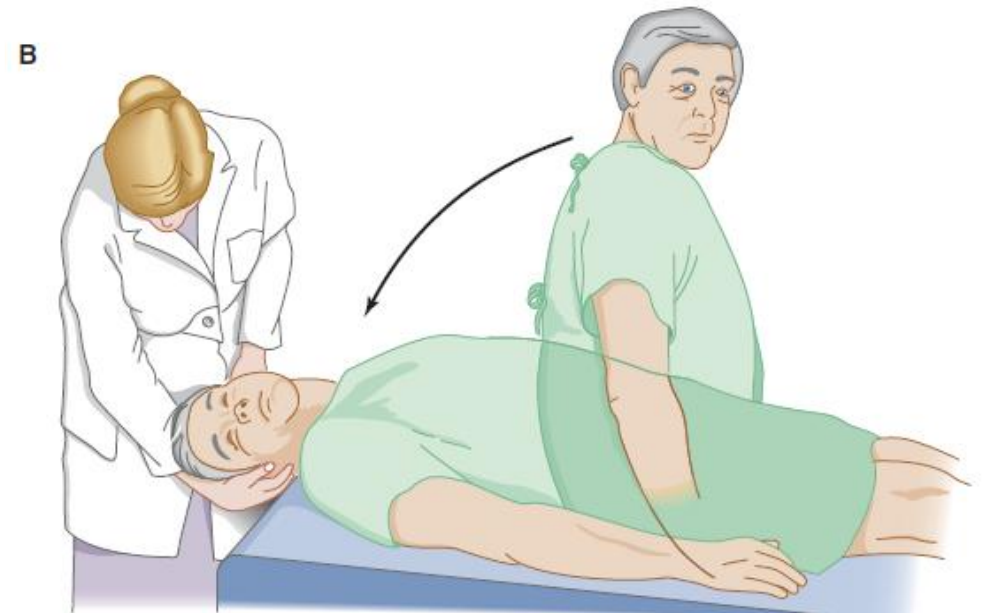
REFLEXES

Assessment of Hearing Loss.

	Weber Test	Rinne Test
Normal	Sound perceived as coming from midline	Air conduction > bone conduction
Sensorineural hearing loss	Sound perceived as coming from normal ear	Air conduction > bone conduction
Conductive hearing loss	Sound perceived as coming from affected ear	Bone conduction > air conduction on affected side

Test for positional vertigo and nystagmus. The patient is seated on a table with the head and eyes directed forward (A) and is then quickly lowered to a supine position with the head over the table edge, 45 degrees below horizontal. The patient's eyes are then observed for nystagmus, and the patient is asked to report any vertigo.

The test is repeated with the patient's head and eyes turned 45 degrees to the right (B), and again with the head and eyes turned 45 degrees to the left (not shown).



Characteristics of Positional Nystagmus.

Feature	Peripheral Lesion	Central Lesion
Vertigo	Severe	Mild
Latency	2-40 s	No
Fatigability	Yes	No
Habituation	Yes	No

	Cerebellar	Upper Motor Neuron	Lower Motor Neuron	Extrapyramidal
Strength	Normal	Decreased	Decreased	Normal
Tone	Decreased	Increased (spastic) ¹	Normal	Increased (rigid) ¹ or decreased
Tendon reflexes	Normal	Increased ¹	Decreased ¹	Normal
Plantar responses	Flexor	Extensor ¹	Flexor	Flexor
Atrophy	Absent	Absent	Present ¹ or absent	Absent
Fasciculations	Absent	Absent	Present ¹ or absent	Absent
Tremor	Intention tremor ¹ or absent	Absent	Absent	Resting tremor ¹ or absent
Chorea or athetosis	Absent	Absent	Absent	Present ¹ or absent
Akinesia	Absent	Absent	Absent	Present ¹ or absent
Ataxia	Present ¹	Absent	Absent	Absent

Clinical Features Distinguishing Cerebellar from Other Motor Systems Disorders.

INVESTIGATIVE STUDIES

BLOOD TESTS

CEREBROSPINAL FLUID

BRAIN IMAGING

EVOKED POTENTIALS

CHEST X-RAY & ECHOCARDIOGRAPHY

AUDIOMETRY

ELECTRONYSTAGMOGRAPHY

Differential Diagnosis of Peripheral Vestibular Disorders.

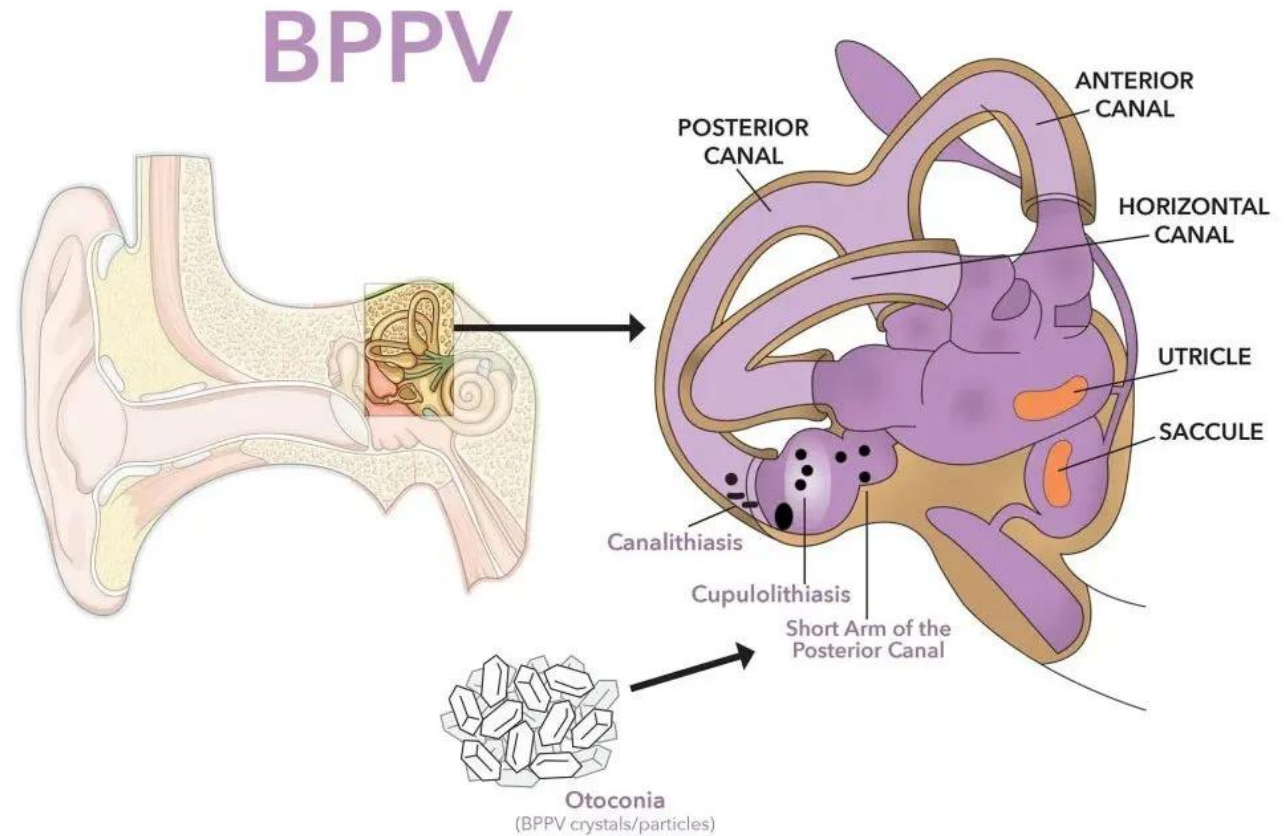
	Hearing Loss		Other Cranial Nerve Palsies
	Conductive	Sensorineural	
Benign positional ver- tigo ¹	—	—	—
Ménière disease ¹	—	+	—
Acute peripheral vestibulopathy ¹	—	—	—
Otosclerosis	+	+	—
Head trauma	±	±	±
Cerebellopontine angle tumor	—	+	±
Toxic vestibulopathy			
Alcohol	—	—	—
Aminoglycosides	—	+	—
Salicylates	—	+	—
Quinine	—	+	—
Vestibulocochlear (VIII) neuropathy			
Basilar meningitis	—	+	±
Hypothyroidism	—	+	—
Diabetes	—	+	±
Paget disease of the skull (osteitis deformans)	—	+	±

BENIGN POSITIONAL VERTIGO

PATHOGENESIS

CLINICAL FINDINGS

TREATMENT



repositioning (Epley) maneuvers

