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GROSS ANATOMY OF
THE VESTIBULOCOCHLEAR NERVE (CN VIII)

By

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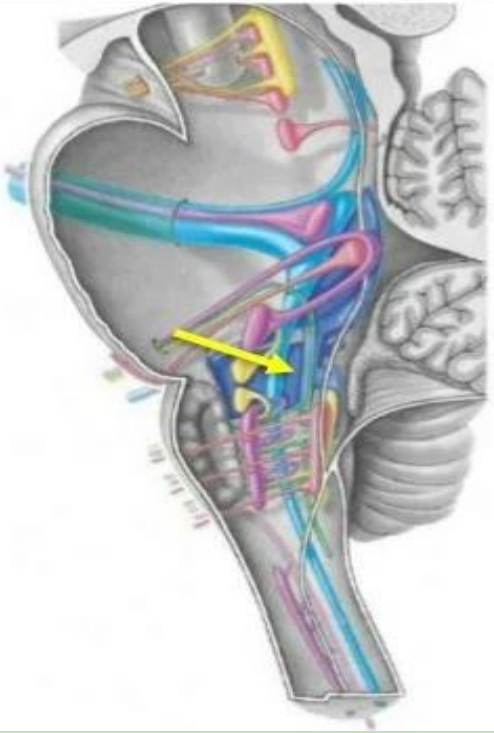
THE VESTIBULOCOCHLEAR NERVE (CN VIII)

- The vestibulocochlear nerve is the eighth paired cranial nerve. It is comprised of two parts – **vestibular** fibres and **cochlear** fibres**.** Both have a purely sensory function.

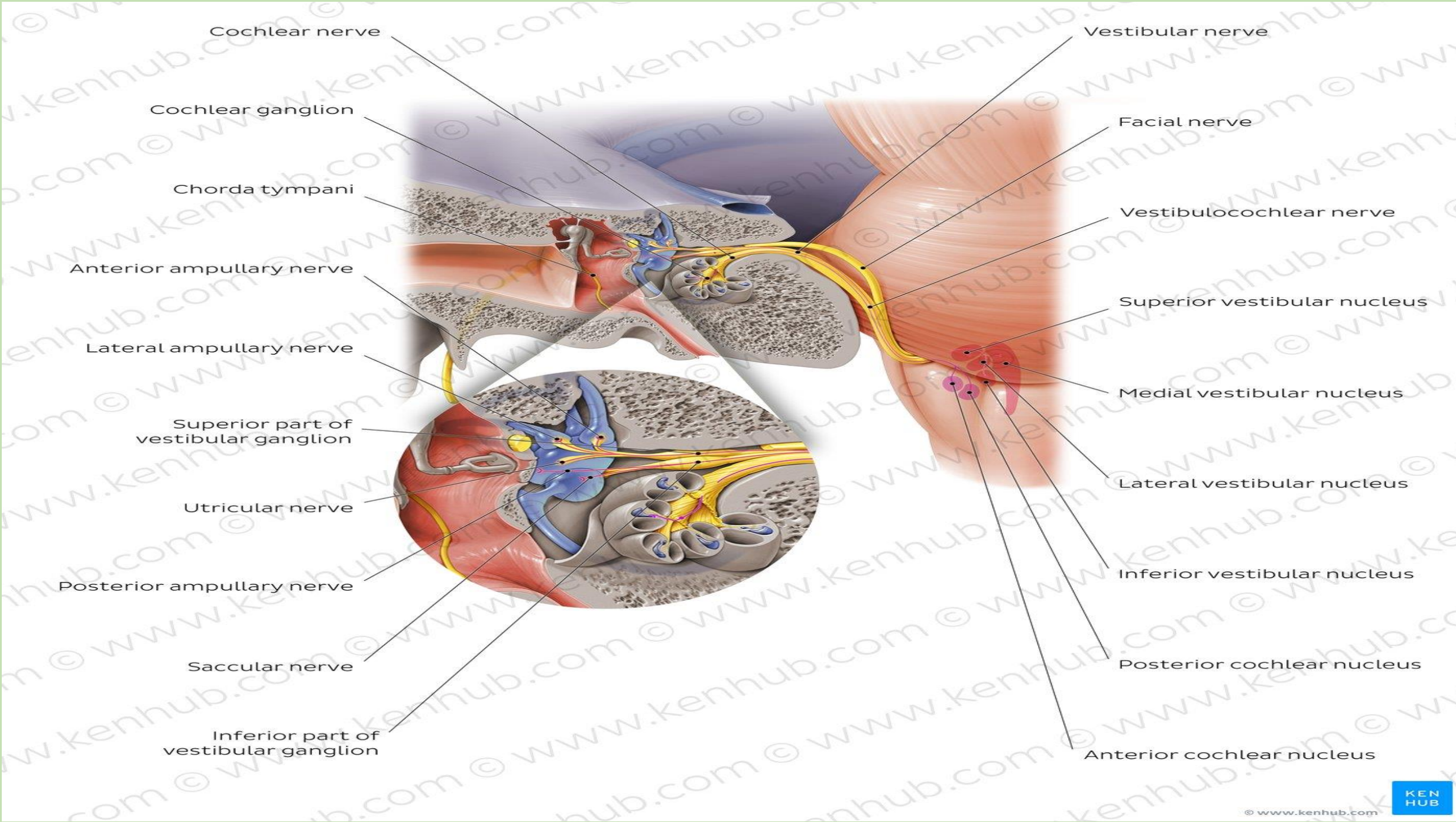
Nerve	Modality	Nucleus	Position	Distribution
Vestibulo-cochlear				
Vestibular	SSA	4 vestibular nuclei	Ponto-medullary junction	Sense of equilibrium (from utricle, saccule & semicircular canals)
Cochlear	SSA	2 cochlear nuclei	On the inferior cerebellar peduncle	Sense of hearing (from organ of Corti)

Cochlear nuclei !!



ANATOMICAL COURSE

- The vestibular and cochlear portions of the vestibulocochlear nerve are functionally discrete, and so originate from different nuclei in the brain:
- **Vestibular component** – arises from the vestibular nuclei complex in the pons and medulla.
- **Cochlear component** – arises from the ventral and dorsal cochlear nuclei, situated in the inferior cerebellar peduncle.
- Both sets of fibres combine in the pons to form the vestibulocochlear nerve. The nerve emerges from the brain at the **cerebellopontine angle** and exits the cranium via the **internal acoustic meatus** of the temporal bone.


Cochlear nerve
Cochlear ganglion
Chorda tympani
Anterior ampullary nerve
Lateral ampullary nerve
Superior part of vestibular ganglion
Utricular nerve
Posterior ampullary nerve
Saccular nerve
Inferior part of vestibular ganglion
Vestibular nerve
Facial nerve
Vestibulocochlear nerve
Superior vestibular nucleus
Medial vestibular nucleus
Lateral vestibular nucleus
Inferior vestibular nucleus
Posterior cochlear nucleus
Anterior cochlear nucleus
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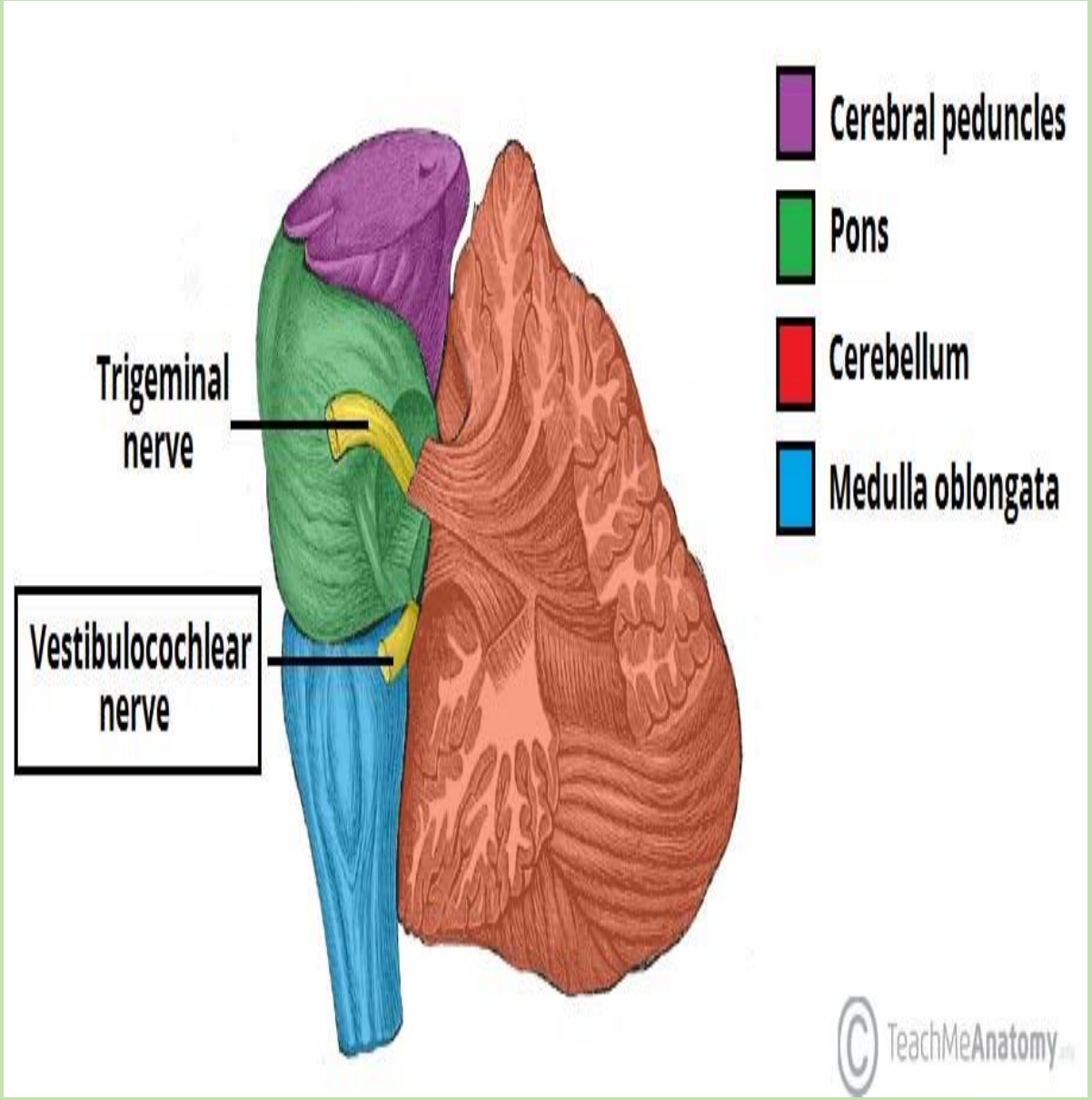
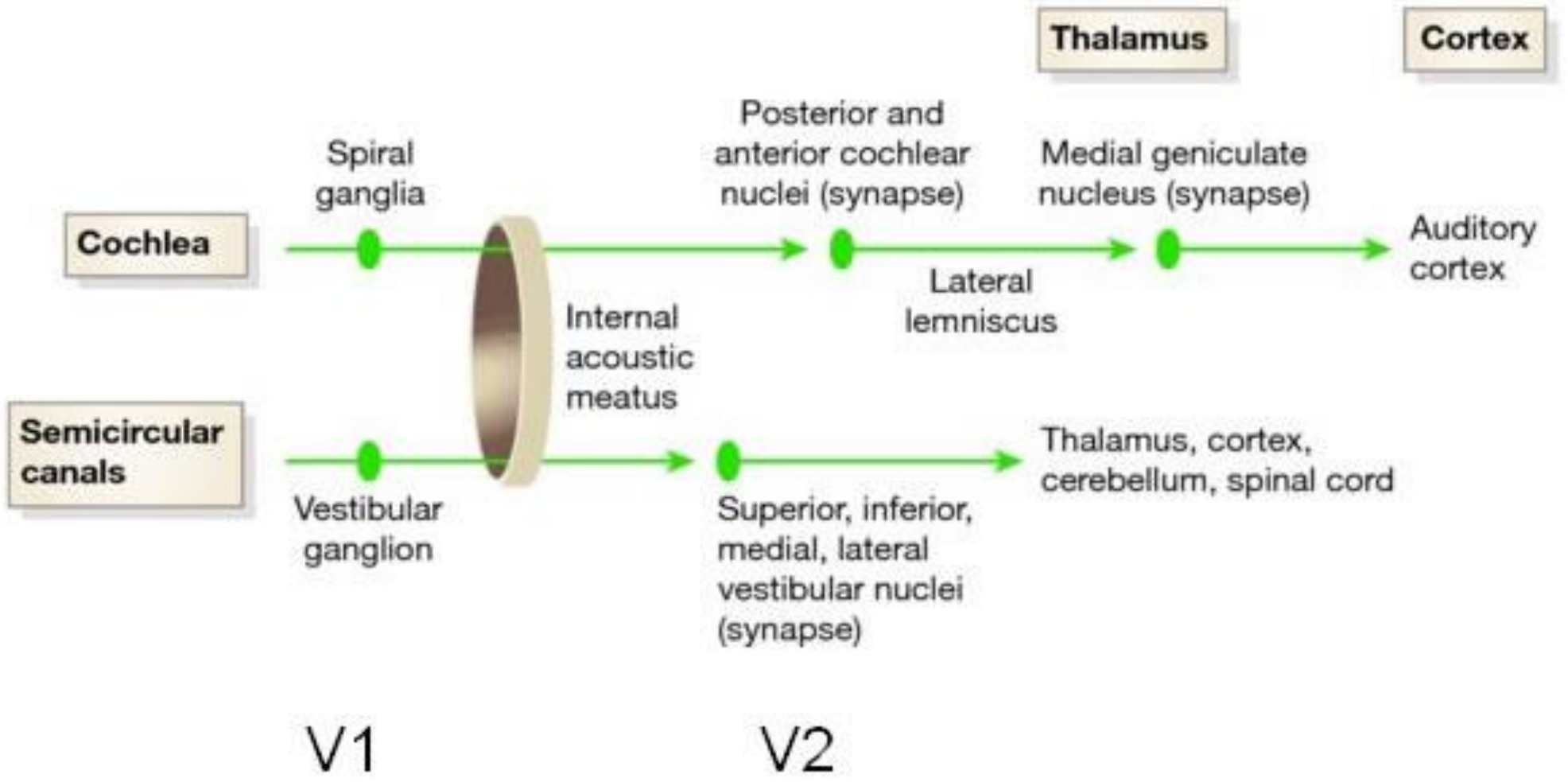
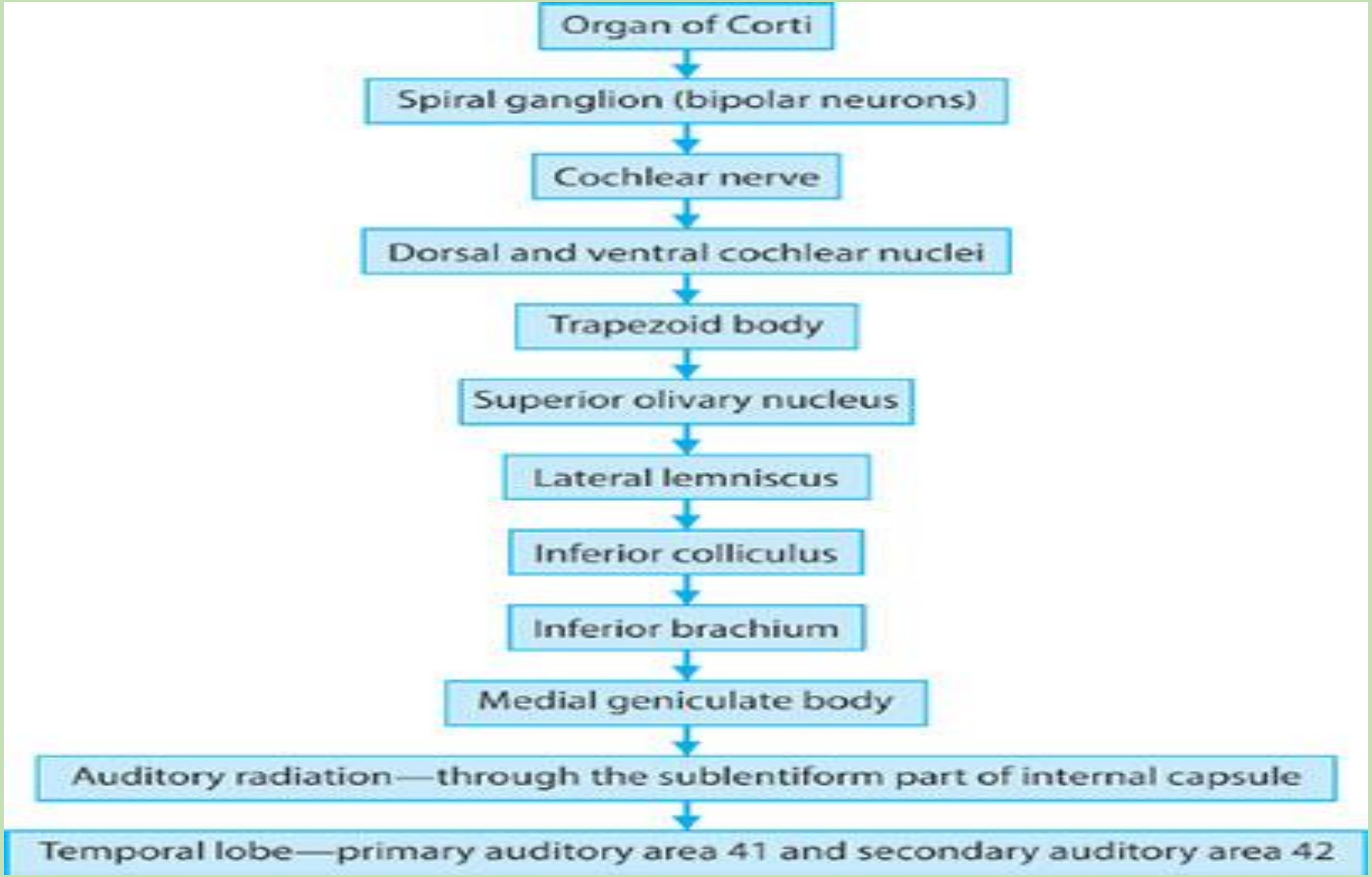
ANATOMICAL COURSE

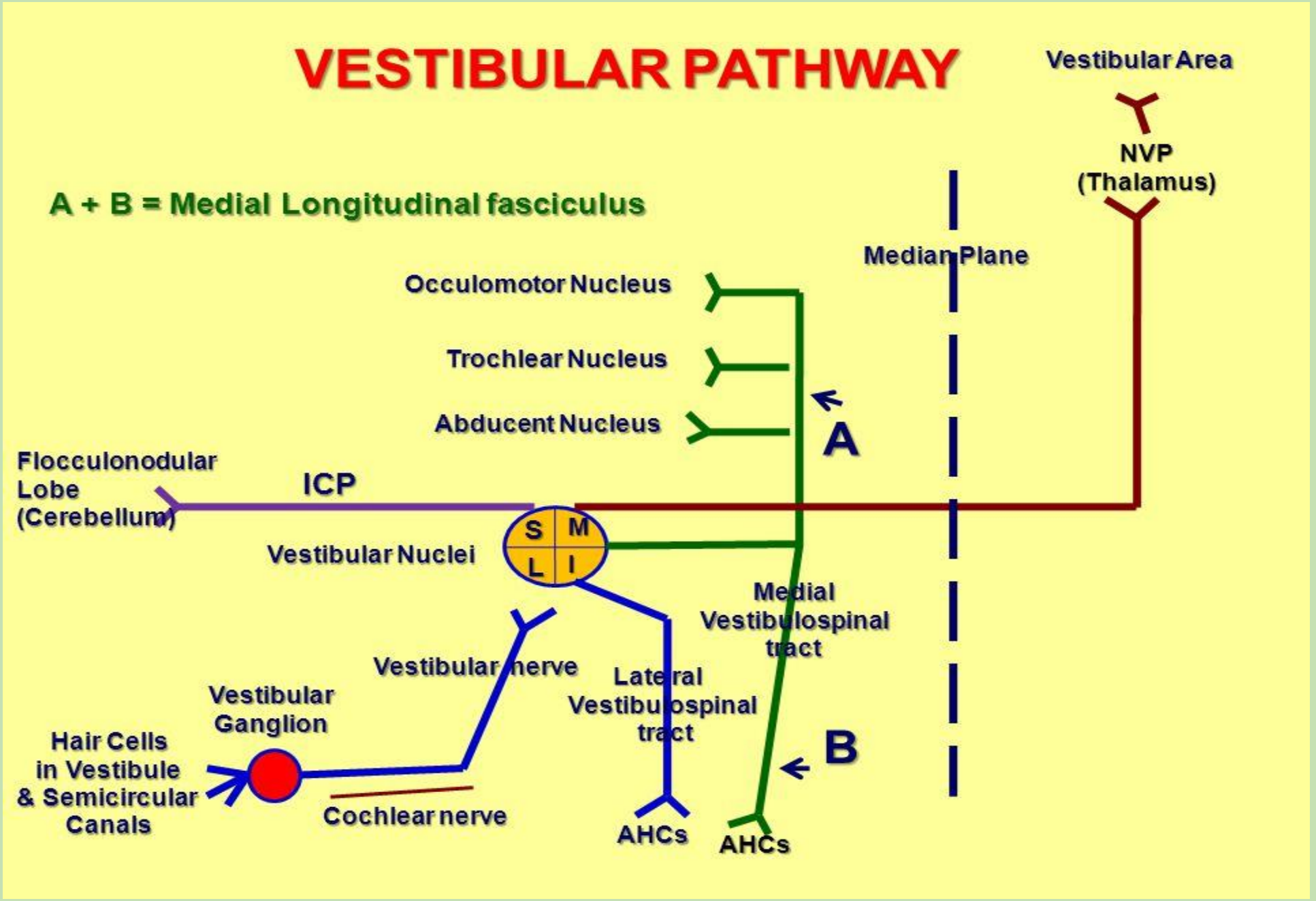
- Within the distal aspect of the internal acoustic meatus, the vestibulocochlear nerve splits, forming the vestibular nerve and the cochlear nerve. The vestibular nerve innervates the **vestibular system** of the inner ear, which is responsible for detecting balance. The cochlear nerve travels to cochlea of the inner ear, forming the **spiral ganglia** which serve the sense of hearing.



THE ORIGIN OF THE VESTIBULOCOCHLEAR NERVE FROM THE CEREBELLOPONTINE ANGLE


Thalamus
Cortex
Posterior and anterior cochlear nuclei (synapse)
Medial geniculate nucleus (synapse)
Spiral ganglia
Cochlea
Auditory cortex
Lateral lemniscus
Internal acoustic meatus
Semicircular canals
Thalamus, cortex, cerebellum, spinal cord
Vestibular ganglion
Superior, inferior, medial, lateral vestibular nuclei (synapse)
V1
V2


Organ of Corti
Spiral ganglion (bipolar neurons)
Cochlear nerve
Dorsal and ventral cochlear nuclei
Trapezoid body
Superior olivary nucleus
Lateral lemniscus
Inferior colliculus
Inferior brachium
Medial geniculate body
Auditory radiation—through the sublentiform part of internal capsule
Temporal lobe—primary auditory area 41 and secondary auditory area 42

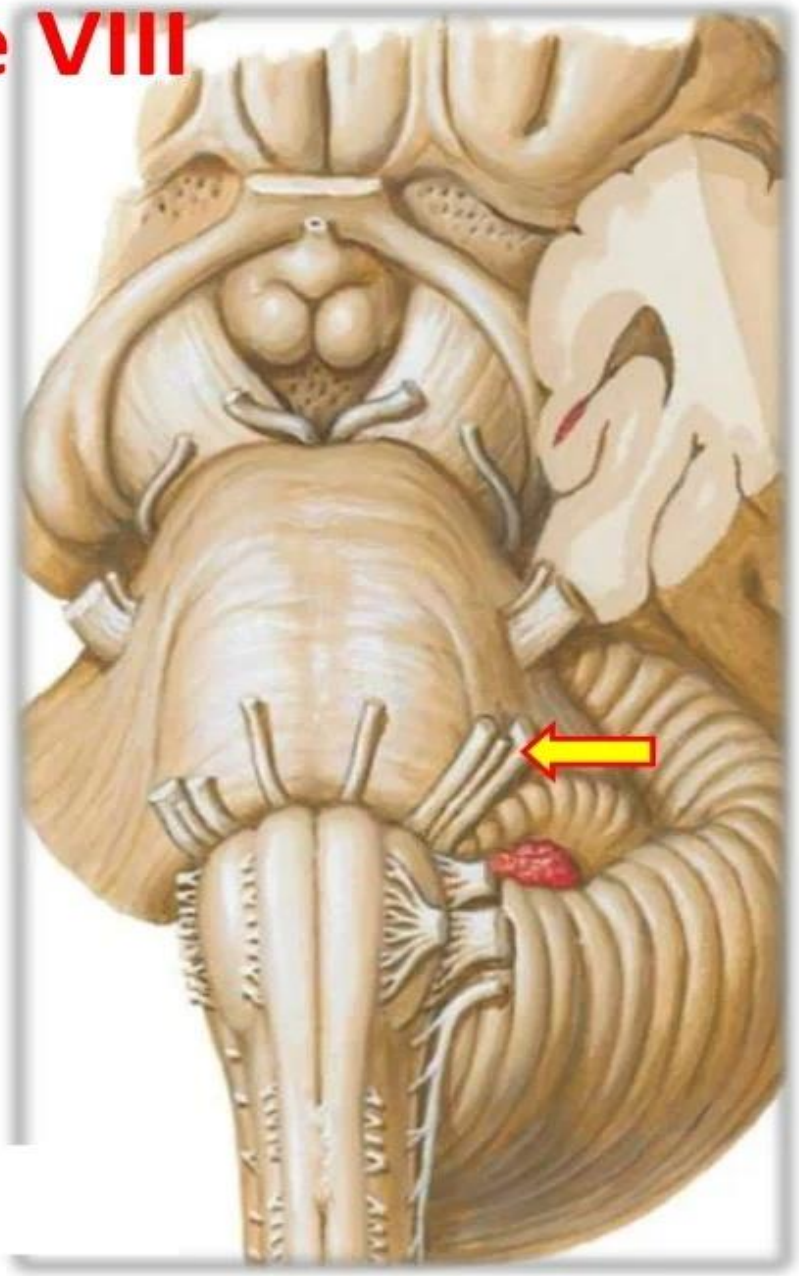

VESTIBULAR PATHWAY
Vestibular Area
NVP
(Thalamus)
A + B = Medial Longitudinal fasciculus
Median Plane
Occulomotor Nucleus
Trochlear Nucleus
Abducent Nucleus
A
Flocculonodular
Lobe
(Cerebellum)
ICP
S
M
L
I
Vestibular Nuclei
Medial
Vestibulospinal
tract
Vestibular nerve
Lateral
Vestibulospinal
tract
Vestibular
Ganglion
B
Hair Cells
in Vestibule
& Semicircular
Canals
Cochlear nerve
AHCs
AHCs

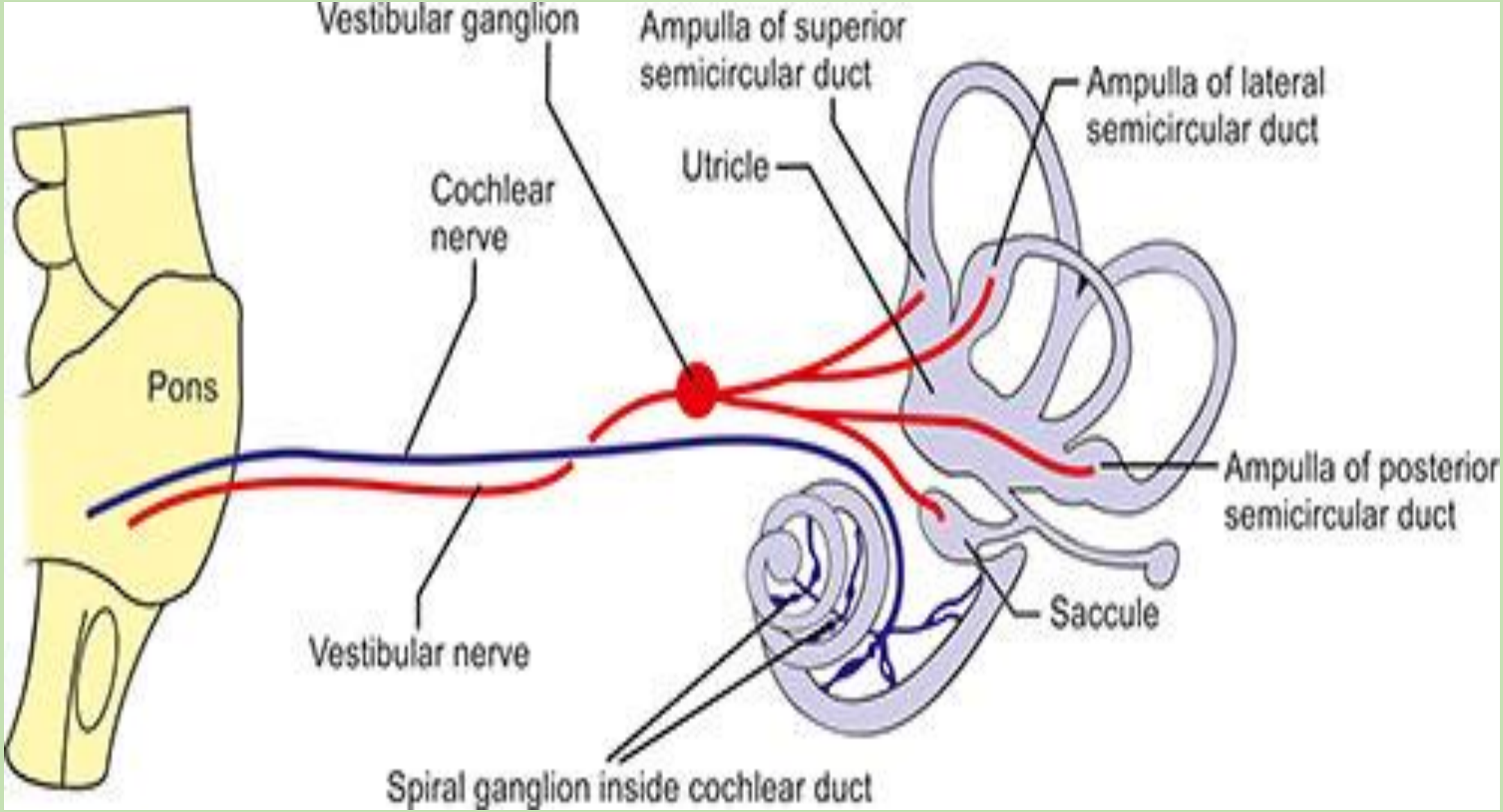
Vestibulocochlear nerve VIII

- The vestibulocochlear nerve [VIII] carries SA fibers for hearing and balance, and consists of two divisions:

1. a vestibular component for balance.
2. a cochlear component for hearing.

- The vestibulocochlear nerve [VIII] attaches to the lateral surface of the brainstem, between the pons and medulla, after emerging from the internal acoustic meatus and crossing the posterior cranial fossa into the single nerve seen in the posterior cranial fossa within the substance of the petrous part of the temporal bone.




Vestibular ganglion
Ampulla of superior semicircular duct
Ampulla of lateral semicircular duct
Utricle
Cochlear nerve
Pons
Ampulla of posterior semicircular duct
Saccule
Vestibular nerve
Spiral ganglion inside cochlear duct

Functions of vestibular system

- **The vestibular system bas three functions:**
- **1. Provides information about movement of the bead and changes head position. This aids in coordinating the position of the eyes, head, and neck and In providing a sense of balance.**
- **2. increase tone in antigravity extensors to support the body against the pull of gravity.**
- **3. Holds eyes on target while the head moves (vestibular impulses counter-roll the eyes against the direction of head movement to maintain fixation).**

CLINICAL RELEVANCE
BASILAR SKULL FRACTURE

- A basilar skull fracture is a fracture of the skull base, usually resulting from major trauma. The vestibulocochlear nerve can be damaged within the internal acoustic meatus, producing symptoms of vestibular and cochlear nerve damage.
- Patients may also exhibit signs related to the other cranial nerves, bleeding from the ears and nose, and cerebrospinal fluid leaking from the ears (**CSF otorrhoea**) and nose (**CSF rhinorrhoea**).

CLINICAL RELEVANCE
VESTIBULAR NEURITIS

- Vestibular neuritis refers to inflammation of the **vestibular branch** of the vestibulocochlear nerve. The aetiology of this condition is not fully understood, but some cases are thought to be due to reactivation of the herpes simplex virus.
- It presents with symptoms of vestibular nerve damage:
- **Vertigo** – a false sensation that oneself or the surroundings are spinning or moving.
- **Nystagmus** – a repetitive, involuntary to-and-fro oscillation of the eyes.
- **Loss of equilibrium** (especially in low light).
- **Nausea** and **vomiting**.
- The condition is usually self-resolving. Treatment is symptomatic, usually in the form of anti-emetics or vestibular suppressants

THANK YOU.....