

Lecture 12

The Cranial Nerve

8

(Vestibulocochlear)

-Done by;

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Auditory Pathway

❑ FIRST ORDER NEURONES:

Cells of **spiral ganglion** in the **cochlea**.

- **Axons** form **cochlear nerve**.
- Cochlear nerve makes **dendritic contact** with **hair cells of Organ of Corti** (in **Cochlear Duct**).

❑ SECOND ORDER NEURONES:

Cells of **dorsal & ventral cochlear nuclei** in Rostral **medulla** (pontomedullary junction).

- Cochlear nuclei belong to **special somatic afferent column** in **brain stem**.
- On ascending, most of axons **decussate** in the **trapezoid body** & form **lateral lemniscus**.
- Some fibers end in **Superior Olivary Nucleus** & **Nucleus of Lateral**

- Superior Olivary Nucleus & Nucleus of Lateral Lemniscus: **modulate transmission of auditory information to cochlear nerve** by:
 1. Sending **inhibitory fibers (olivocochlear fibers)** through vestibulocochlear nerve ending in Organ of Corti.
 2. Establishing **connection with motor neurones** supplying tensor tympani & stapedius muscles.

❑ THIRD ORDER NEURONES:

Cells of **inferior colliculus (midbrain)**. Both colliculi are **interconnected** by **commissural fibers**.

❑ FOURTH ORDER NEURONES:

Cells of **medial geniculate nucleus** (**thalamus**).

- **Axons** form **auditory radiation** that pass through **retrolenticular part of internal capsule**.

- Auditory radiation ends in **primary auditory cortex** (**superior temporal gyrus**) which is **connected to auditory association cortex**.
- N.B.: Representation of cochlea is **bilateral** at all levels **above cochlear nuclei**.

Vestibular Pathway

❑ FIRST ORDER NEURONES:

Cells of Vestibular ganglion located in **Internal Auditory Meatus**.

- The vestibular nerve fibers make **dendritic contacts** with hair cells in vestibule & semicircular canals.

❑ SECOND ORDER NEURONES:

Cells of **Superior**, **Lateral**, **Medial** & **Inferior** Vestibular Nuclei in **medulla & pons**.

- Vestibular nuclei belong to **special somatic afferent column** in **brain stem**.

CONNECTIONS OF VESTIBULAR PATHWAY:

❖ Axons of vestibular nuclei may:

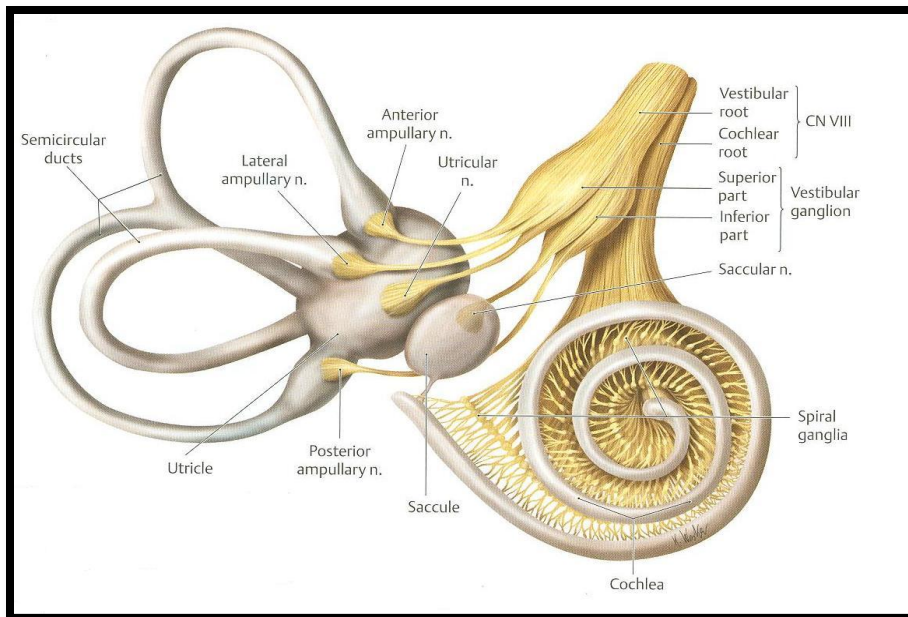
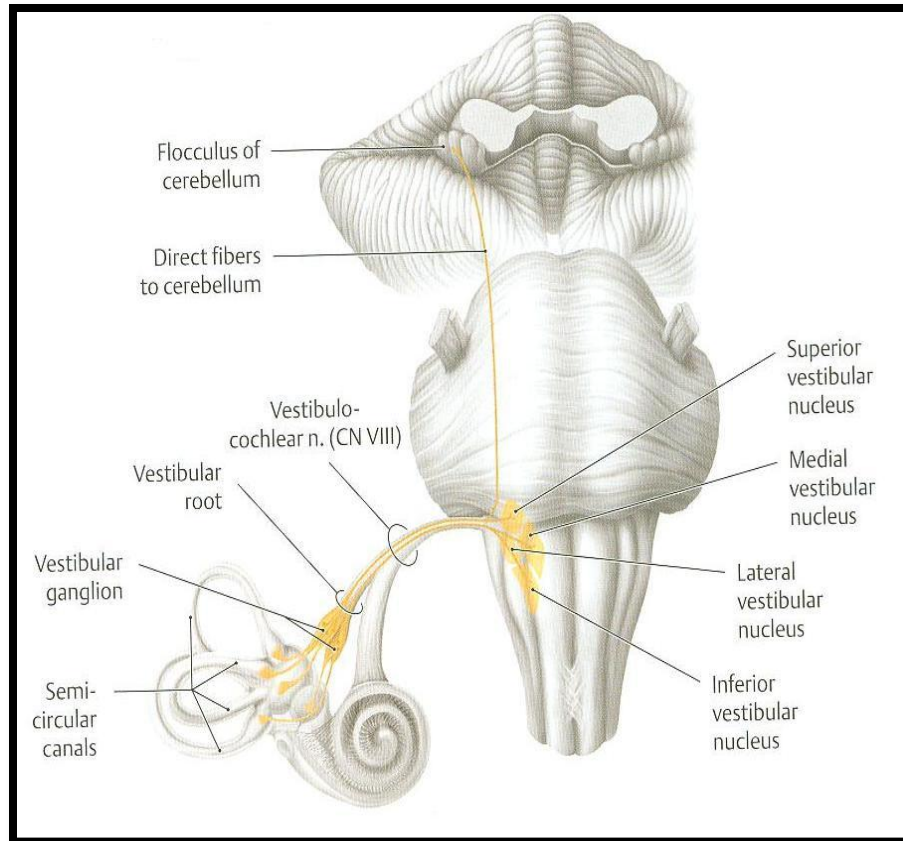
1. **Descend** as lateral **vestibulospinal** tract to **anterior horn cells** of spinal cord.
2. **Join** medial longitudinal fasciculus & **descend** as **medial vestibulospinal** tract to **anterior horn cells** of spinal cord.
3. **Pass** through inferior cerebellar peduncle to **flocculonodular lobe of cerebellum**.
4. **Cross** midline & ascend to **ventral posterior nucleus** of **thalamus** then to **vestibular area in cerebral cortex**.

❖ Medial Longitudinal fasciculus: formed of both descending & ascending fibers:

1. **Descending** (medial vestibulospinal tract) to anterior horns cells for control of body **posture & balance**.
2. **Ascending** to Oculomotor, Trochlear & Abducent Nuclei (Motor Nuclei for extraocular muscles) for **coordination of head & eye movements**.

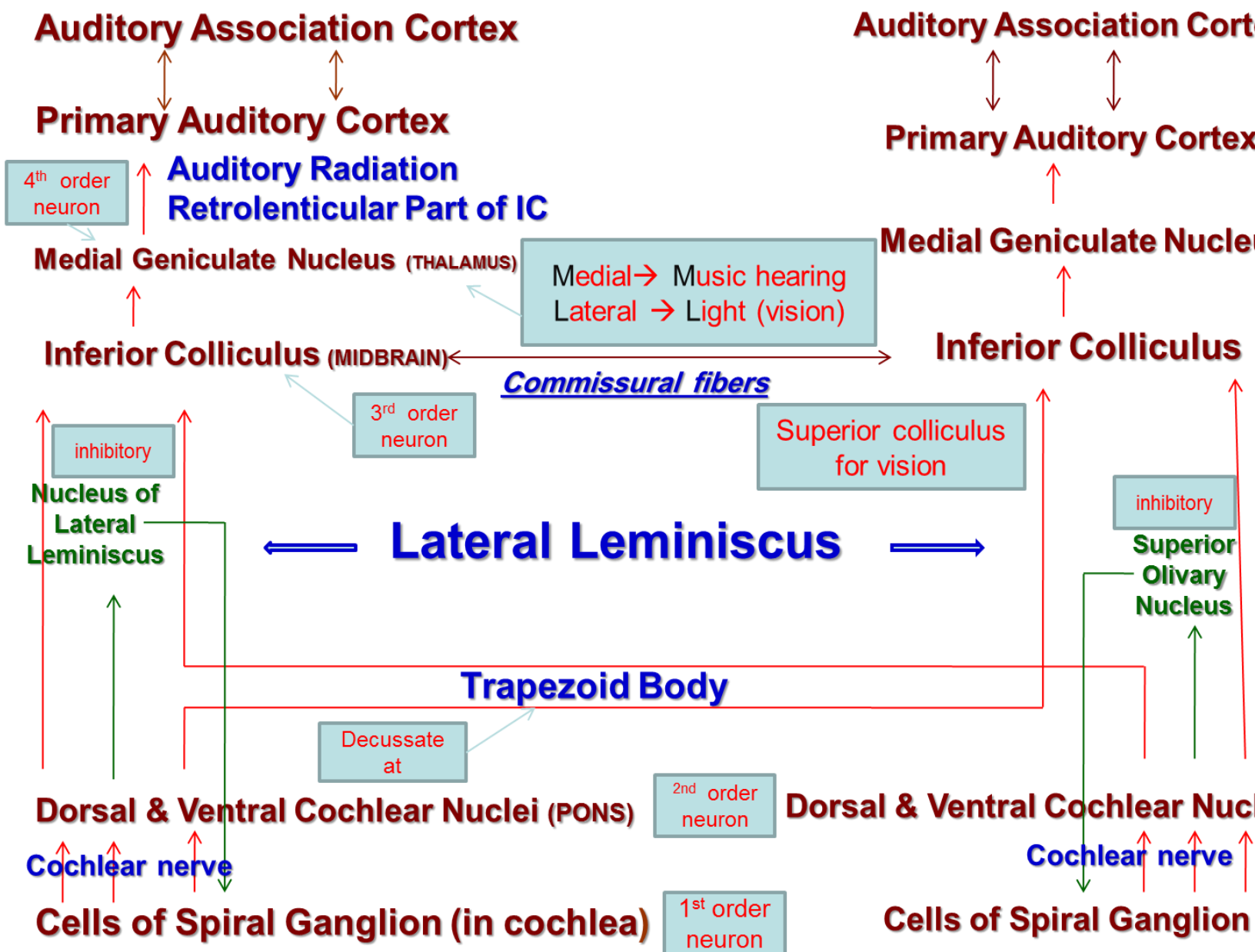
❖ Vestibular area:

1. Located in the **lower part of postcentral gyrus** (head area).
2. Responsible for **conscious awareness** of vestibular sensation.



- **Inferior colliculi**, **medial geniculate** nucleus and finally **auditory cortex** are stations in cochlear pathway.
- Hearing is **bilaterally** represented.
- Vestibular nuclei are connected to: **spinal cord** (directly or through medial longitudinal fasciculus, **flocculonodular lobe of cerebellum** and **to vestibular area of cerebral cortex**.
- **Ganglia** related to vestibulocochlear nerve are located in the **inner ear**.
- Vestibular & cochlear nerves meet & **emerge** then pass **through internal auditory meatus** to **cranial cavity**, then enter **pons** at **pontocerebellar angle**, **lateral** to facial nerve.

In the next two pages are the diagrams Dr. Fat'hallah gave us with some points added.



VESTIBULAR PATHWAY

