



The external, middle ear & cranial nerve VII.

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objects

- 1-Make a list of structures making the external and middle ear.
- 2-Define each part–use keywords.
- 3-High light the structural features of the external auditory meatus.
- 4-Describe the shape, position and various boundaries of the middle ear.
- 5-Discuss the features of the tympanic membrane.
- 6-Describe the ossicles and their muscles.
- 7-Describe the auditory tube, its openings and structure.
- 8-Have an idea about mastoid air cells and their connection to the middle ear.
- 9-Follow up the facial nerve from the brain down to the stylomastoid foramen.(turn page))
- 10-Follow up the central connections of the facial nerve.
- 11-Note the proximity of the internal carotid artery to the middle ear.

The ear is the receptor organ for hearing and equilibrium

- Composed of three main regions:

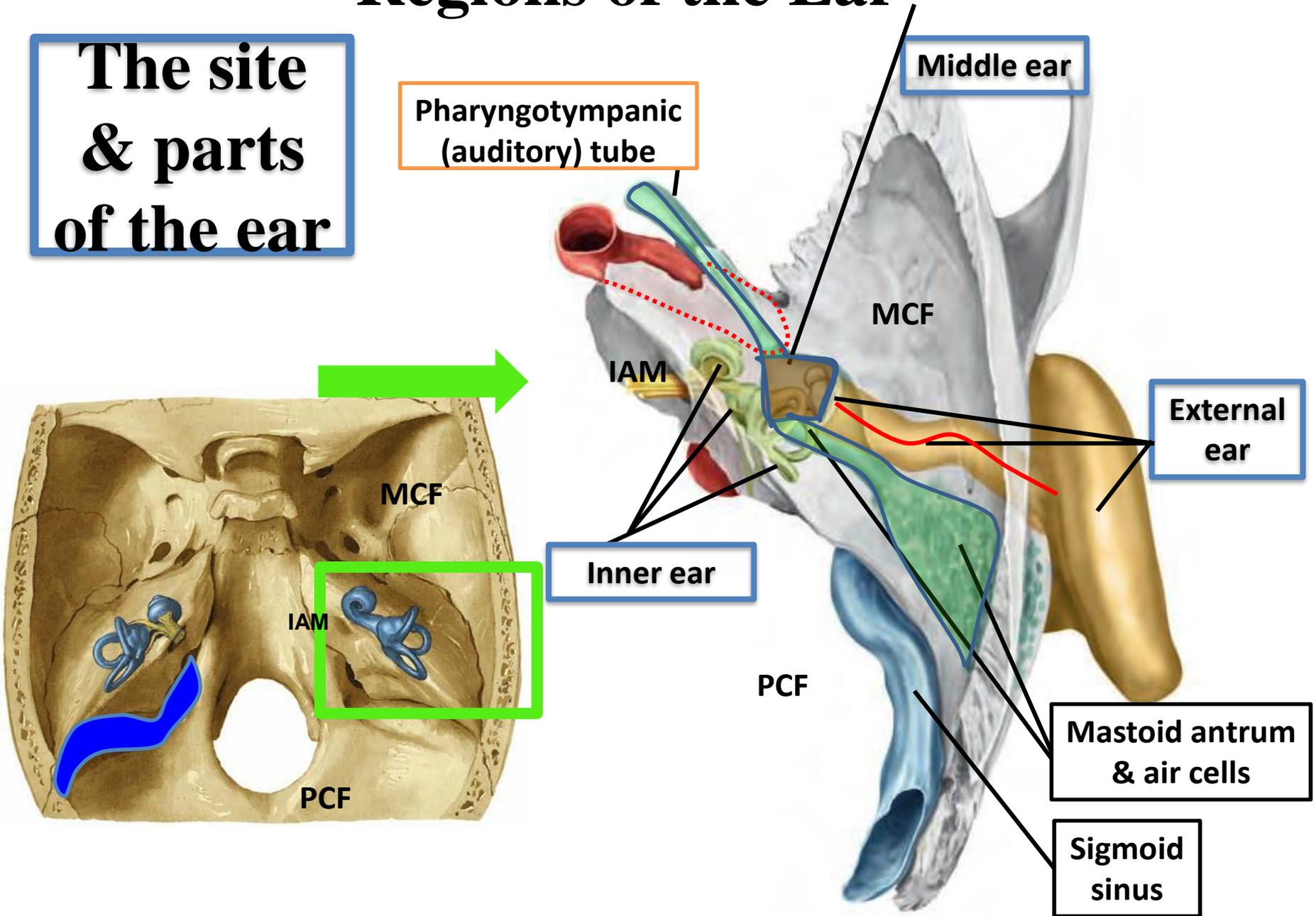
-Outer ear  Hearing

-Middle ear  Hearing

-Inner ear  Hearing & Equilibrium

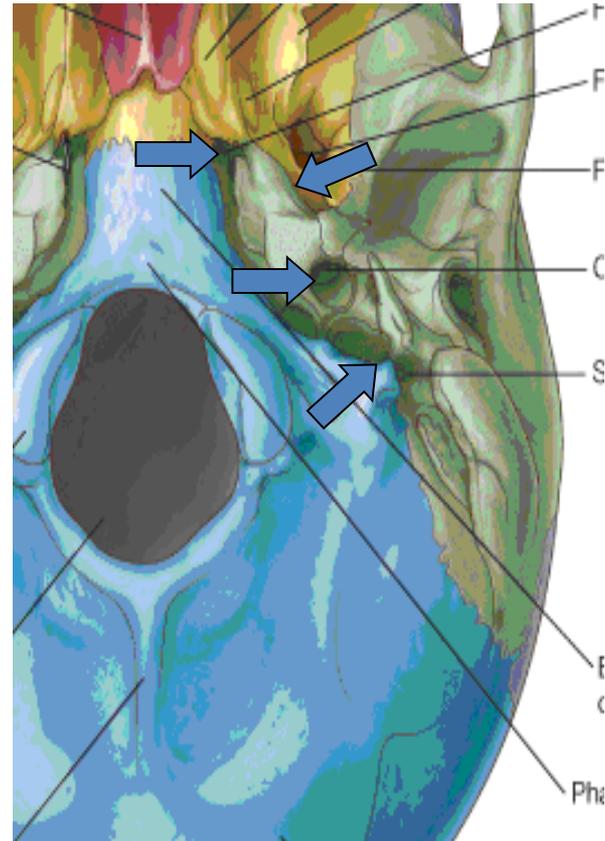
Regions of the Ear

The site
& parts
of the ear



Petreous part:

- * Contains the ear.
- * Triangular in shape.
- * Its apex is opposite F. lacerum.
- * Its center shows the carotid canal.
- * Its medial border shows the jugular F.
- * Its lat. border shows a groove for the auditory tube.

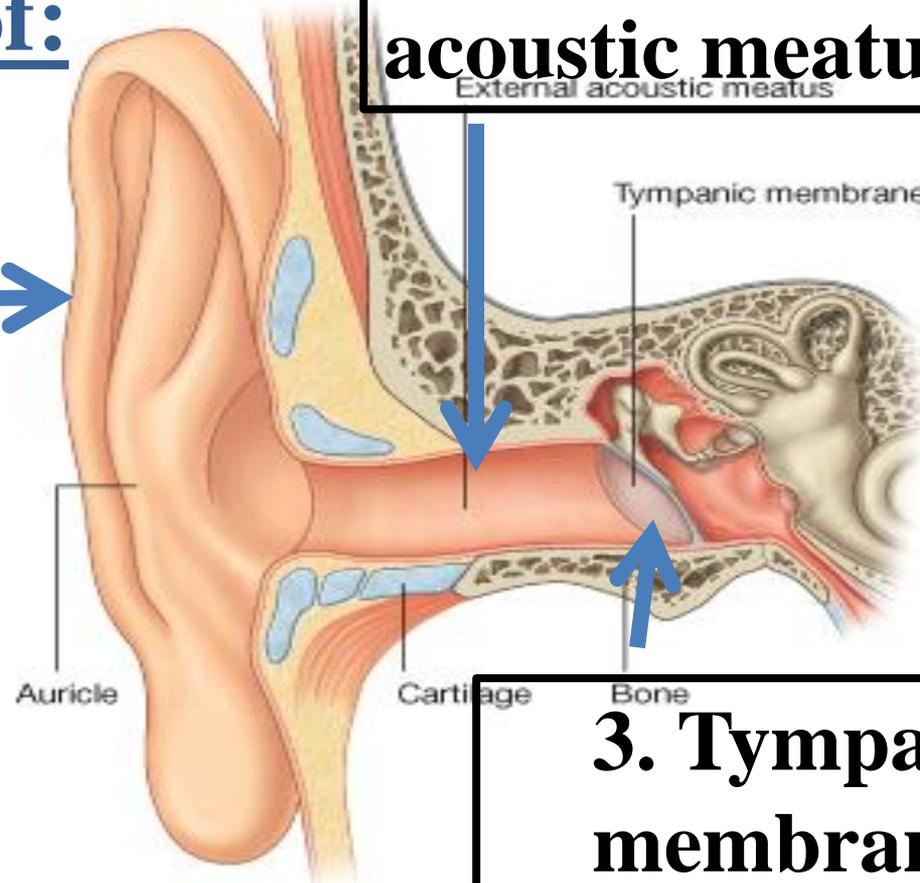


External Ear

Composed of:

**1. The auricle
(pinna)**

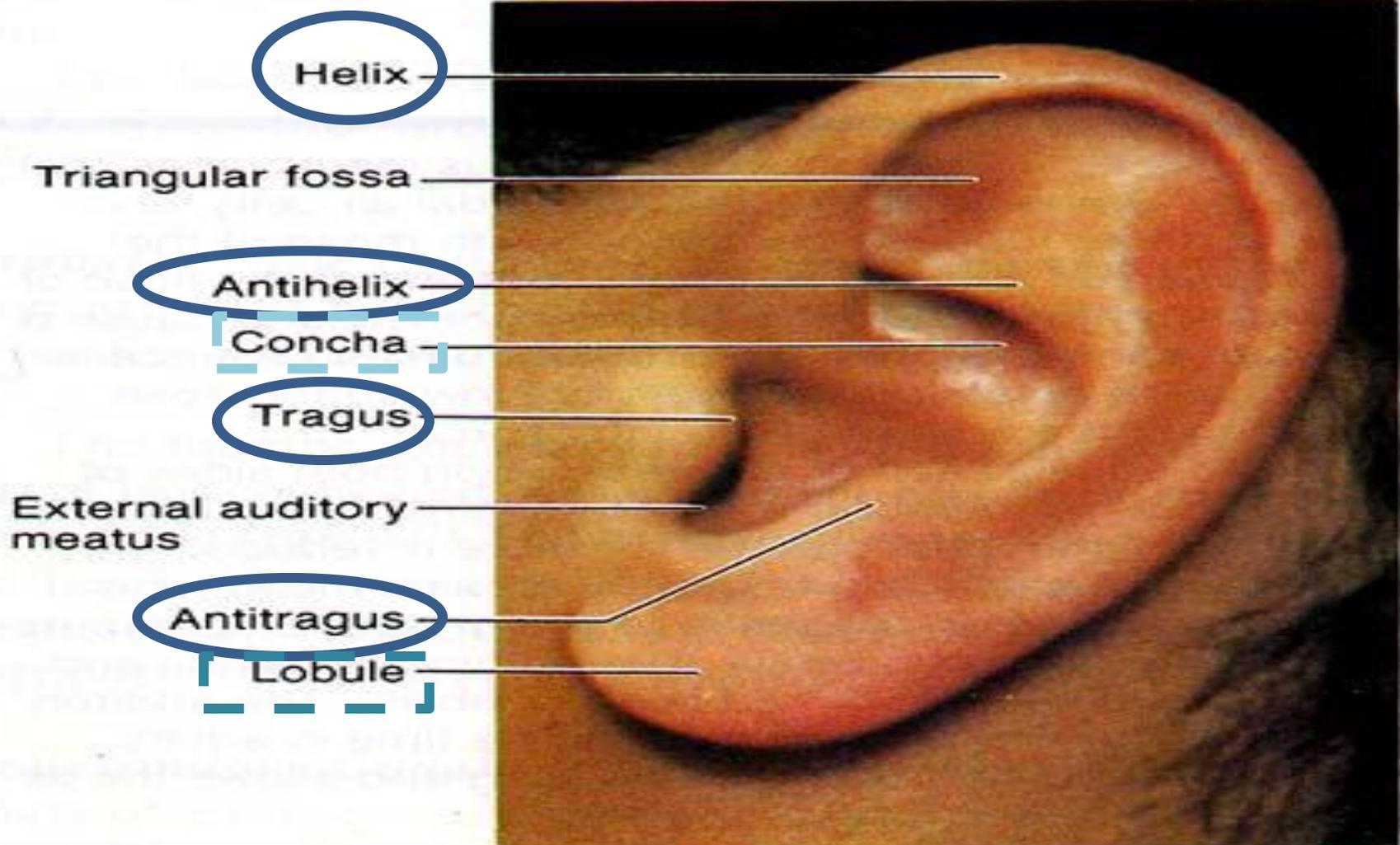
**2. External
acoustic meatus**



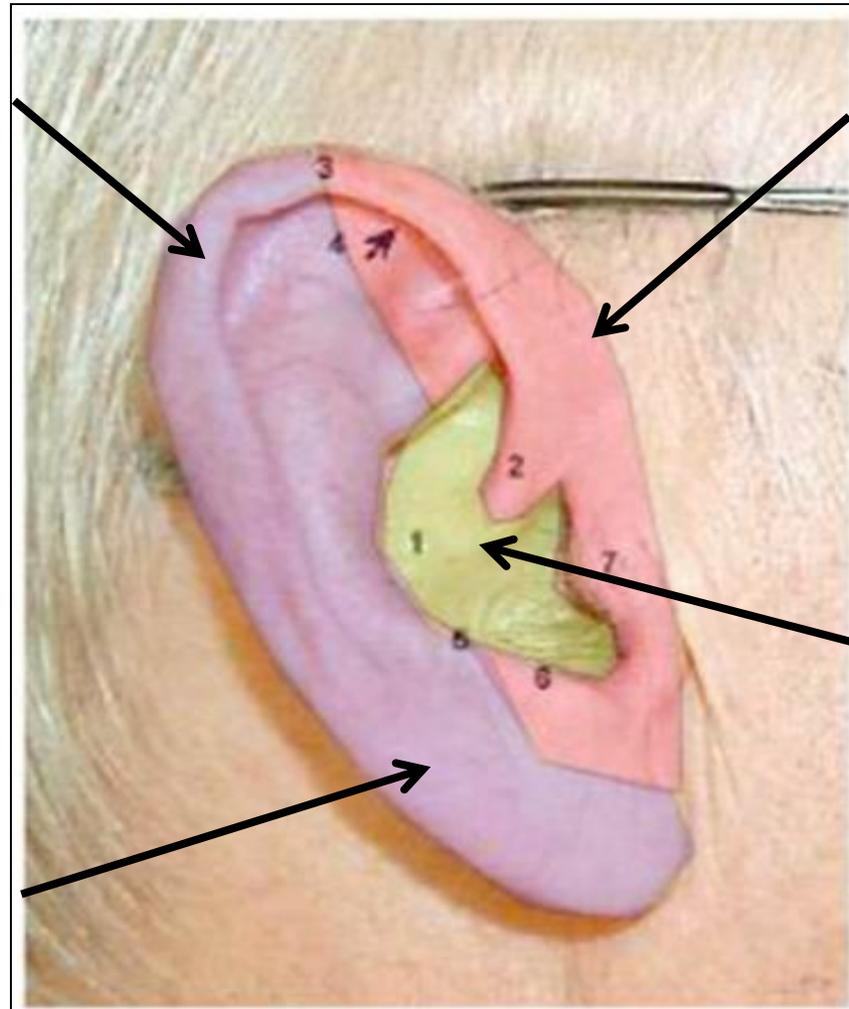
**3. Tympanic
membrane**

A- The Auricle

The surface anatomy of the auricle of the ear.



Sensory Supply of The Auricle



▪ Auriculotemporal branch of the mandibular nerve [V₃].

▪ The concha is supplied by branches from the facial nerve [VII] and the vagus nerve [X].

Lesser occipital

▪ cervical plexus

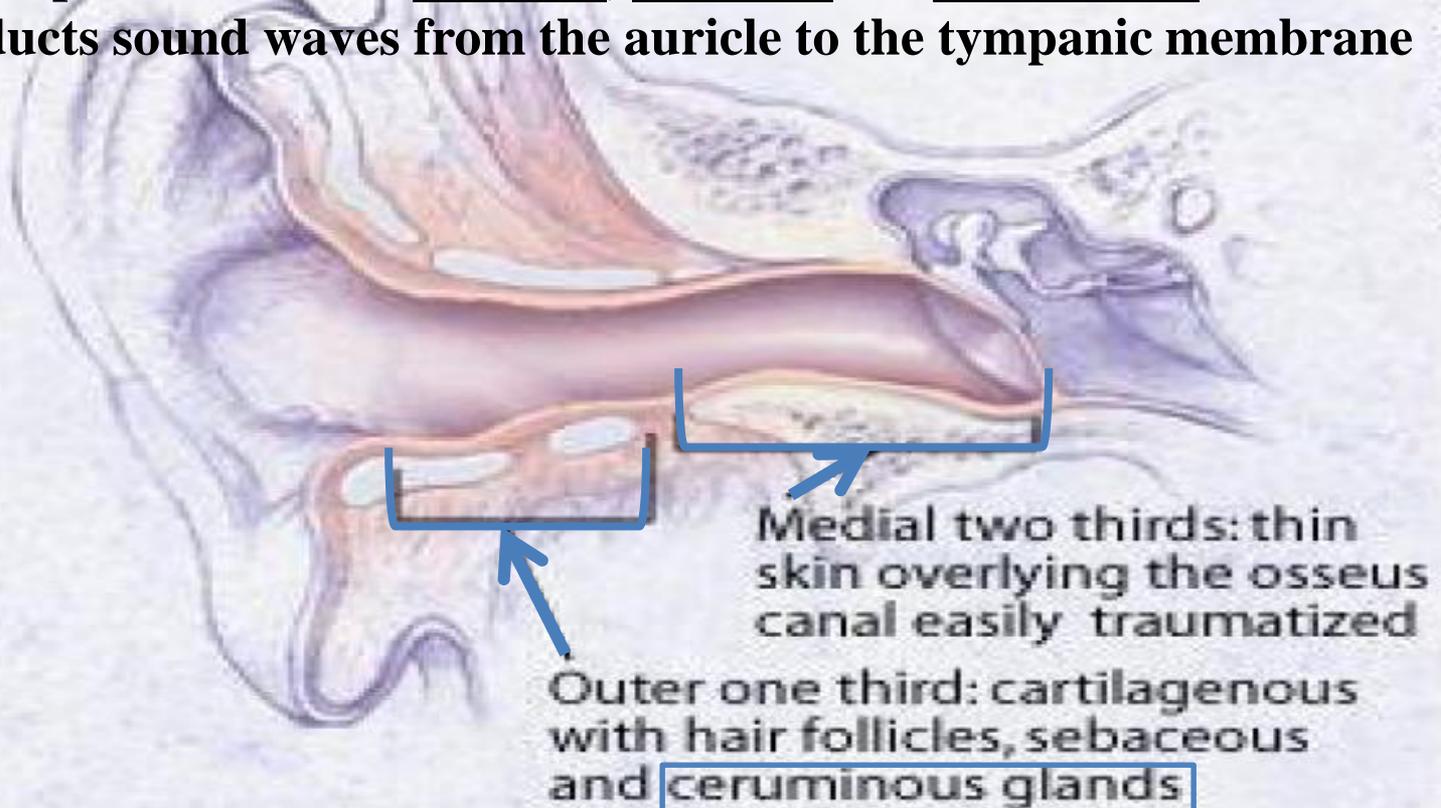
Great auricular

B- External Auditory Meatus

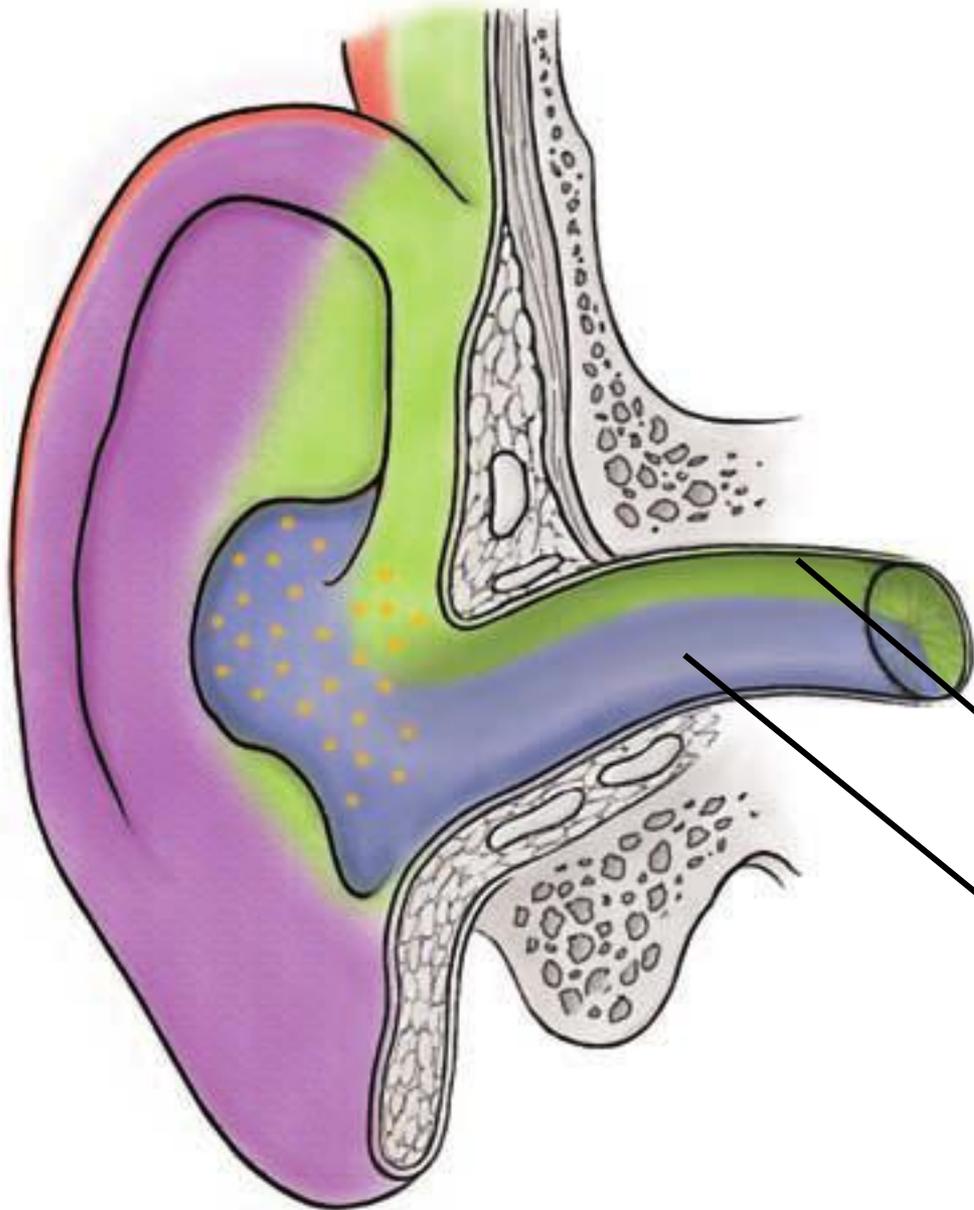
It is a wide **S** shaped tube & covered by Skin

Its inner part is directed medially, forward and downwards

It conducts sound waves from the auricle to the tympanic membrane

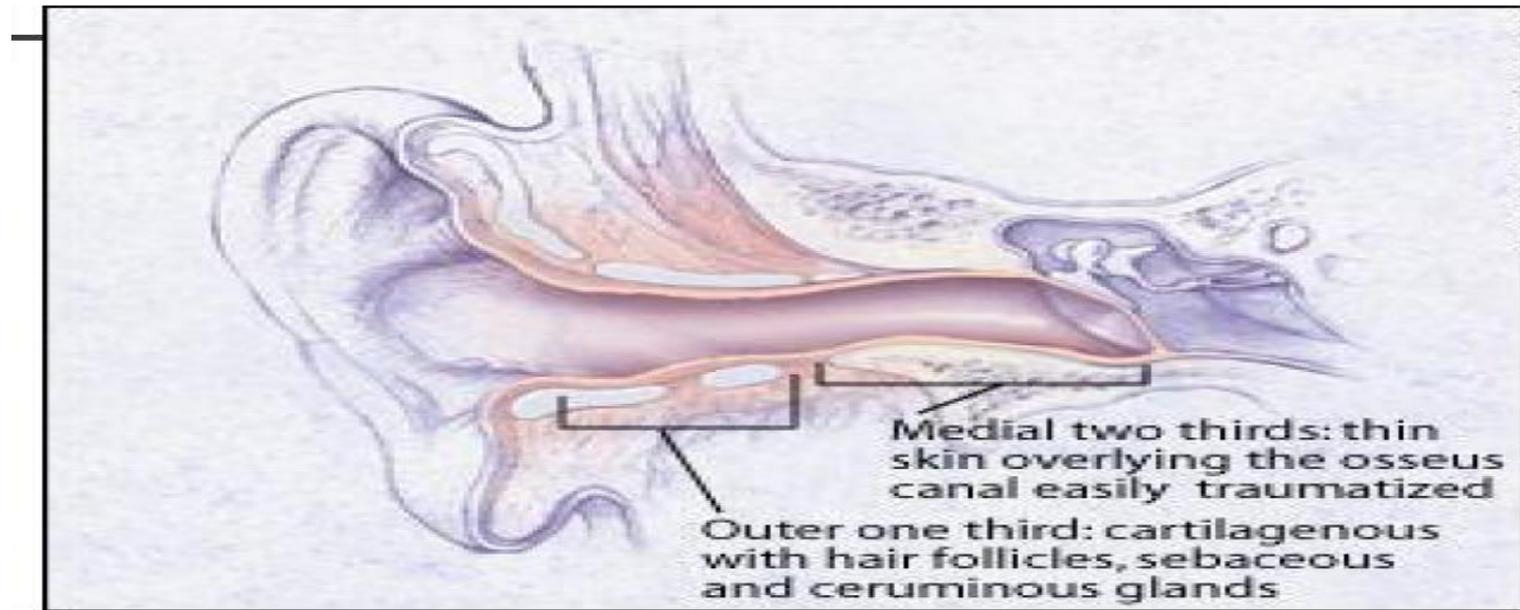


are modified sweat glands that secrete a yellowish brown wax



**Auriculotemporal
(CN V3)**

**Auricular
branch
of vagus (CN X)**



Otoscopic examination:

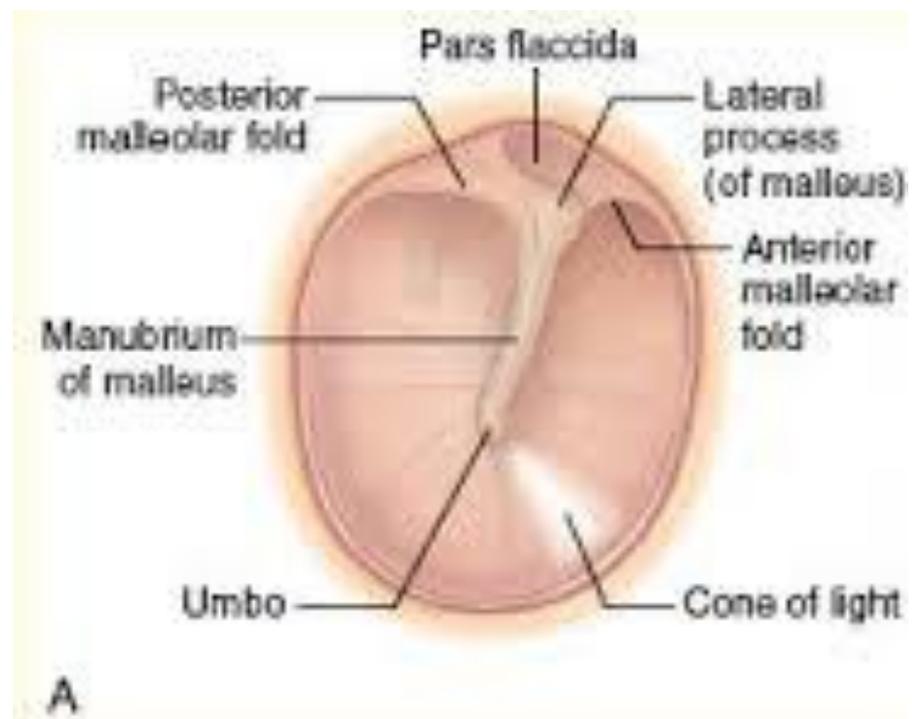
Examination of the tympanic membrane is facilitated by first straightening the external auditory meatus by gently pulling the auricle

upward, backward and laterally in the adult, and straight backward in the infant.

C- Tympanic Membrane

The Tympanic membrane is formed of Three layers:

- 1- Outer layer (skin)**
Stratified squamous epithelium
- 2- Middle fibrous layer**
- 3- Inner mucous layer**
formed by the mucous membrane



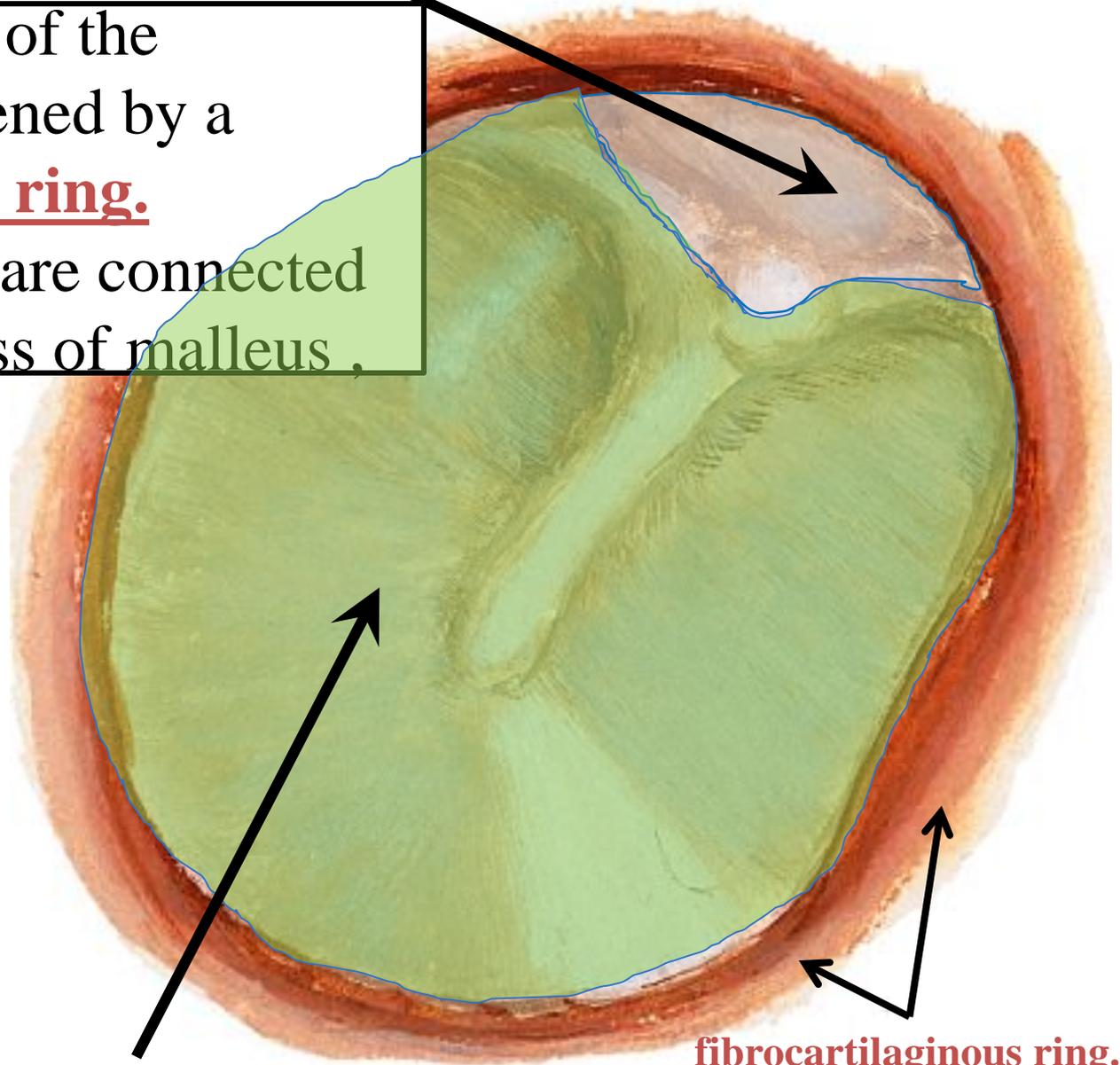
Pars flaccida

The circumference of the membrane is thickened by a **fibrocartilaginous ring**.

Two fibrous bands are connected to the lateral process of malleus,

Parts

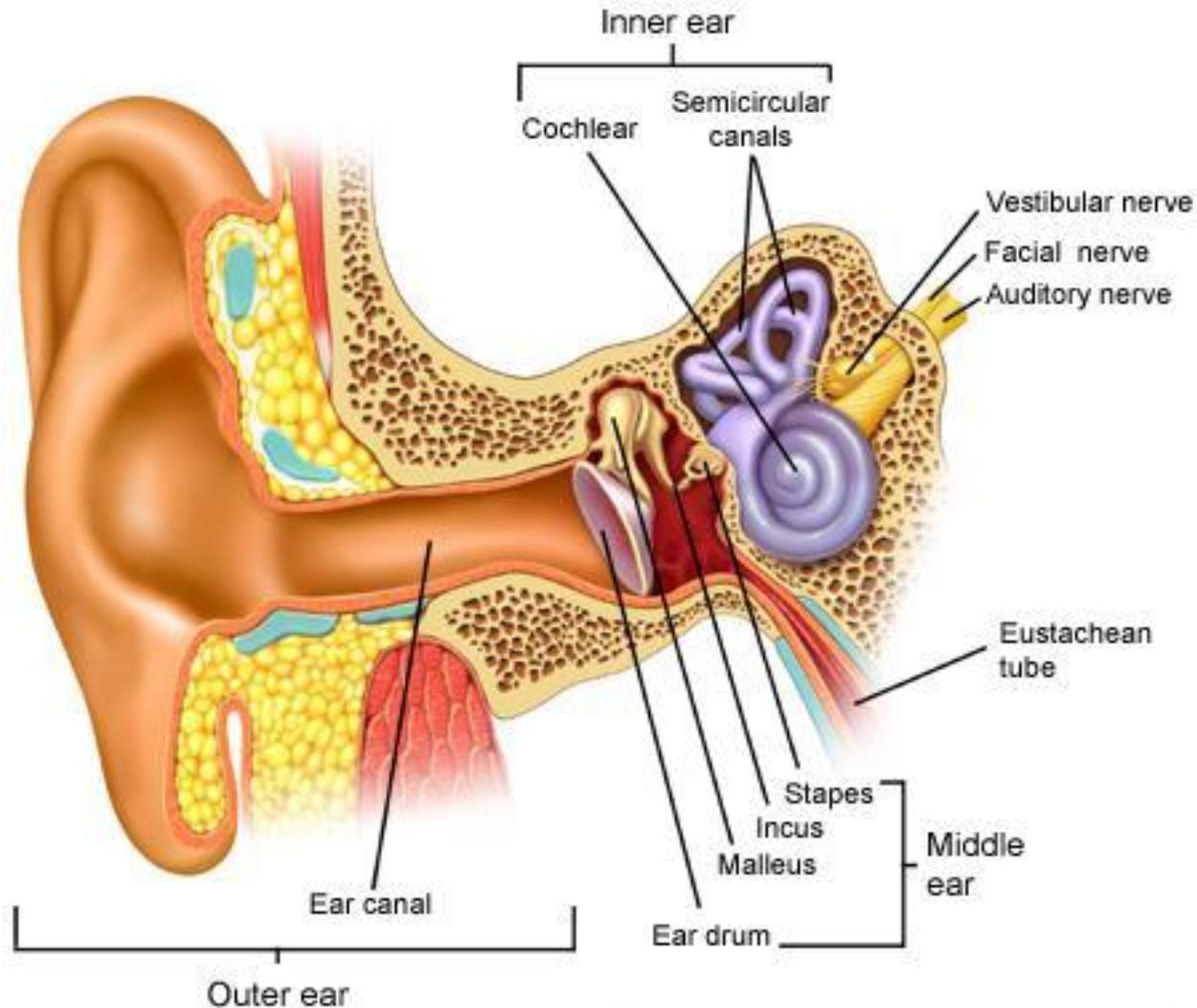
- **Pars tensa**
(the major part)
- **Pars flaccida**
(the small triangular upper part).



Pars tensa

fibrocartilaginous ring.

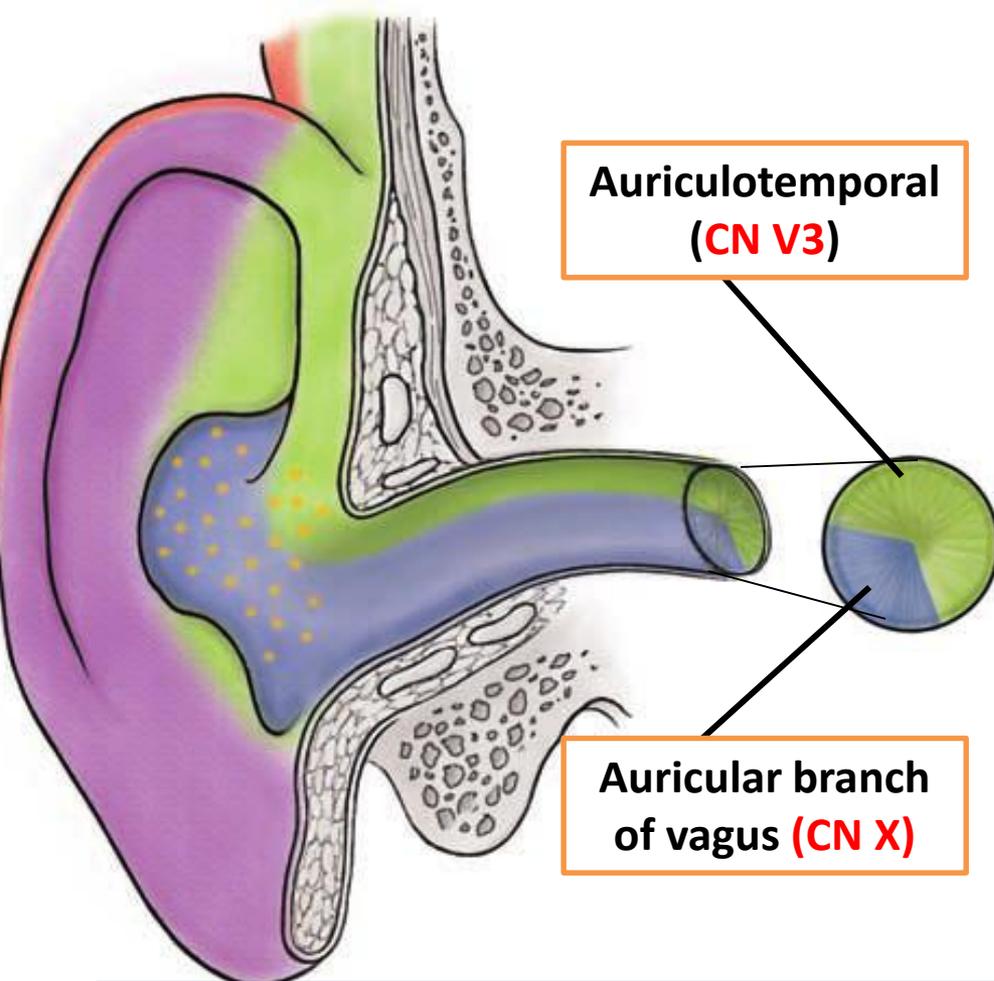
- The tympanic membrane is a thin, fibrous membrane that is **pearly gray**. The membrane is obliquely placed, facing downward, forward, and laterally. It is concave laterally, and at the depth of the concavity is a small depression, the **(UMBO)**, produced by the tip of the handle of the malleus.



Examination of the tympanic membrane by Otoscope

When the membrane is illuminated through an otoscope, the concavity produces a “cone of light,” which radiates anteriorly and inferiorly from the umbo **(CONE OF LIGHT)**



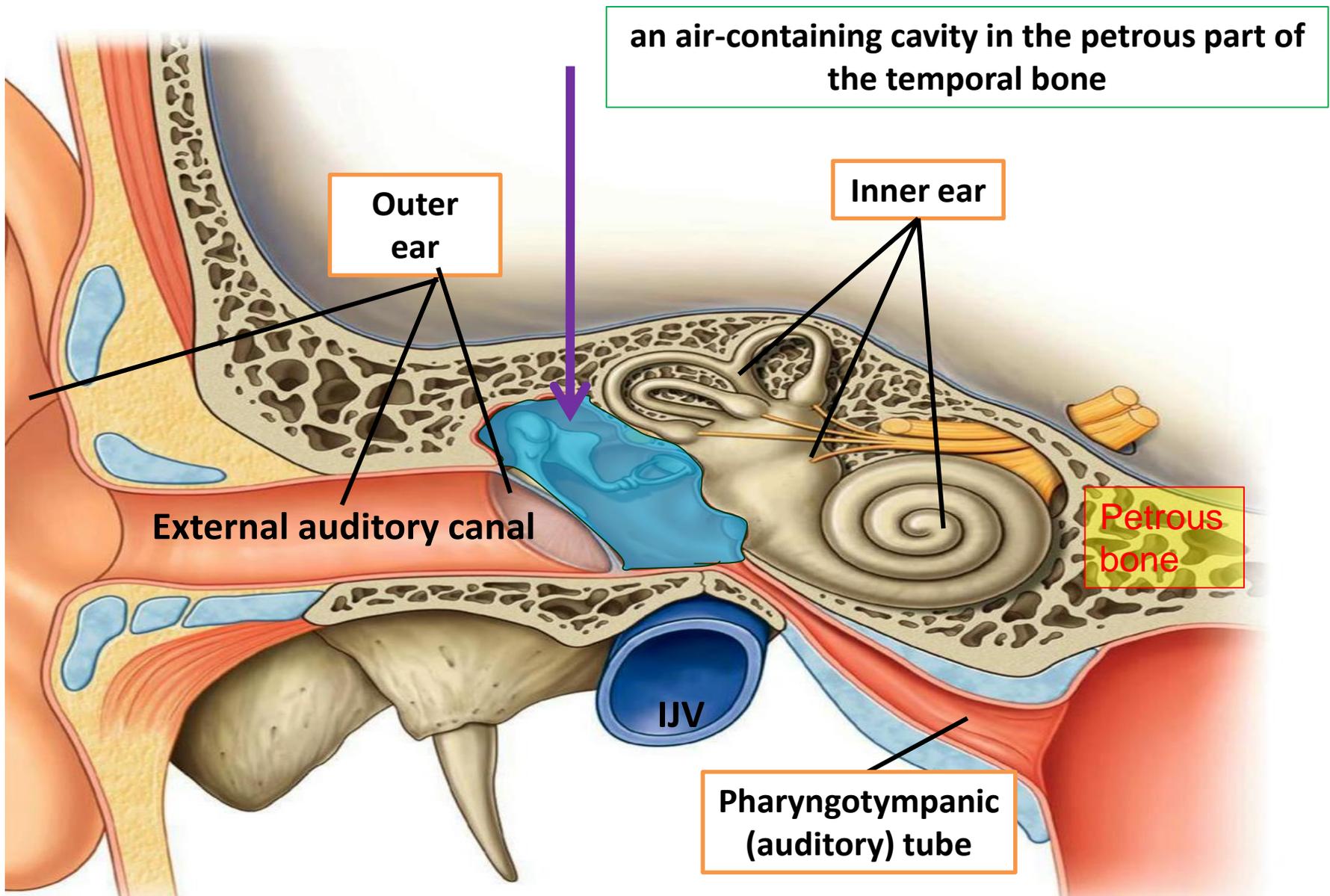


Tympanic nerve (branch of CN IX)

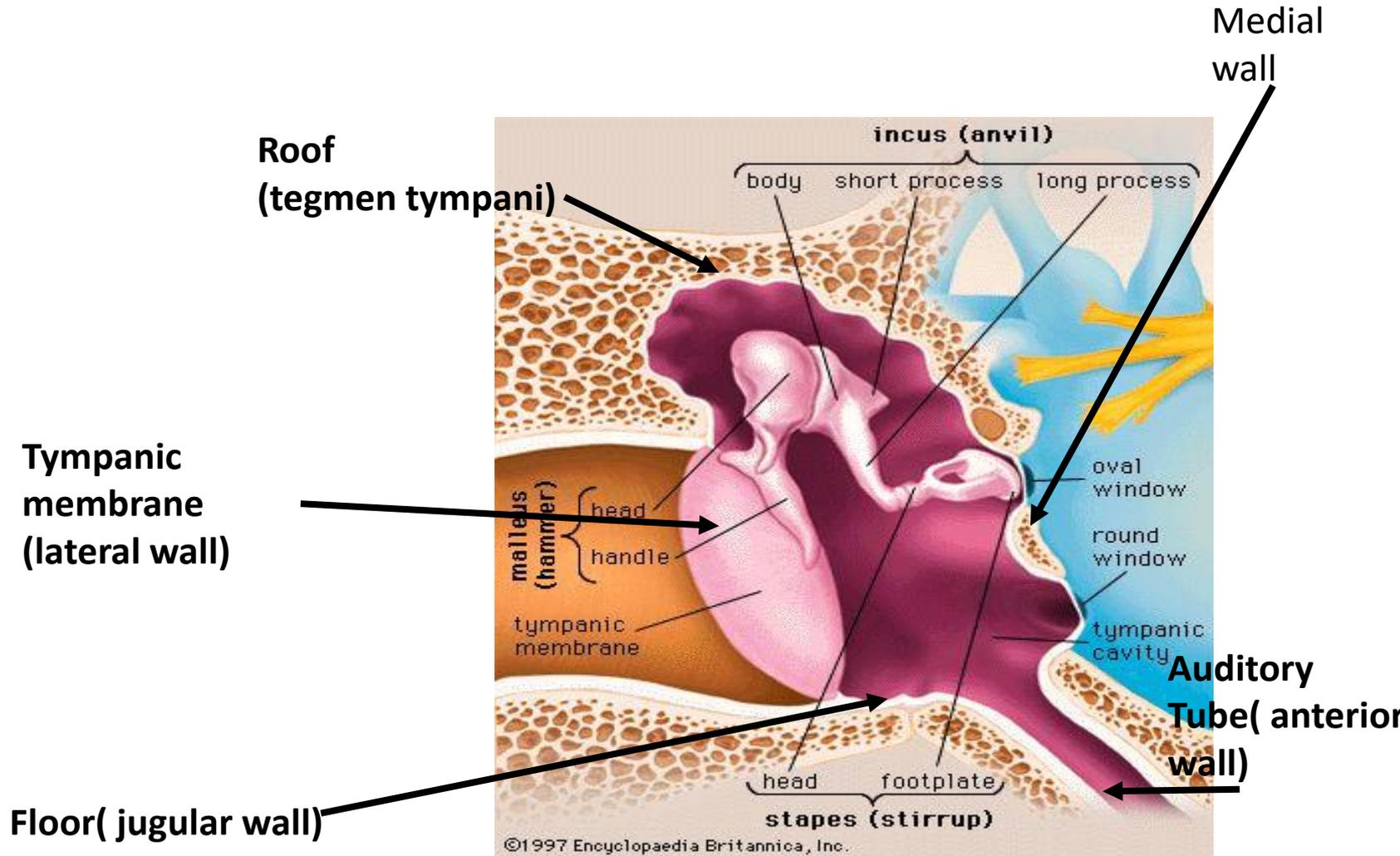
- Outer surface is supplied by auriculotemporal nerve and auricular branch of vagus nerve.
- Inner surface is supplied by the tympanic br. of glossopharyngeal nerve) via tympanic plexus.

The tympanic membrane is extremely sensitive to pain

MIDDLE EAR



Middle ear (walls and contents)



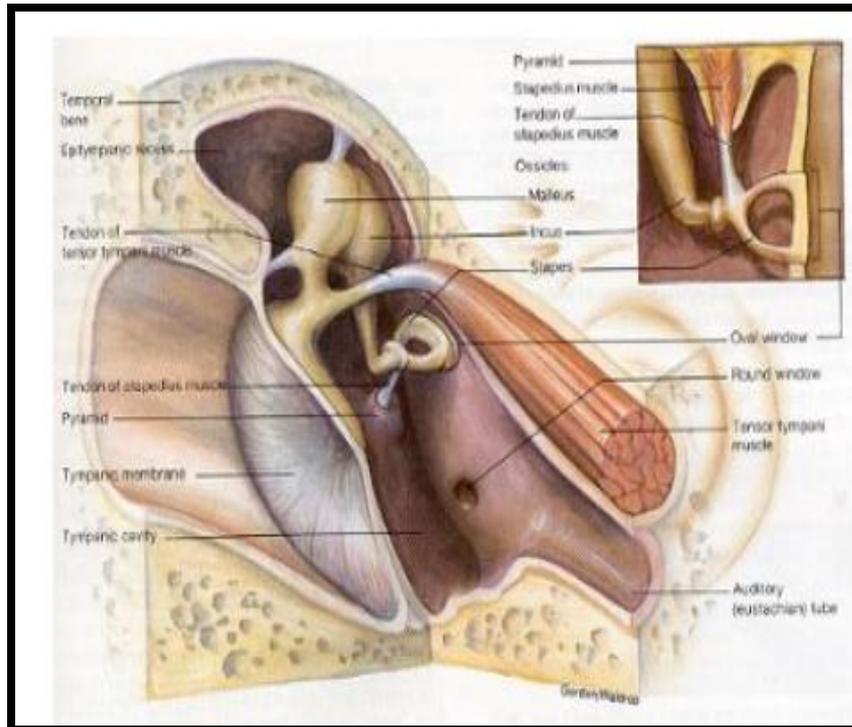
MIDDLE EAR



Walls



- 1- Anterior
- 2- Posterior
- 3- Lateral
- 4- Medial
- +
- 5- Roof
- 6- Floor



Contents



- Three Ossicles
- Two muscles

POSTERIOR WALL

ANTERIOR WALL

ROOF

Tegmen tympani

Thin plate of bone separating the tympanic cavity from the meninges & temporal lobe of the brain

Aditus to Mastoid antrum

Opening of Canal for Tensor tympani

Opening of Pharyngo-tympanic tube

Pyramid from whose apex emerges the tendon of the stapedius muscle

Vertical part of Facial canal

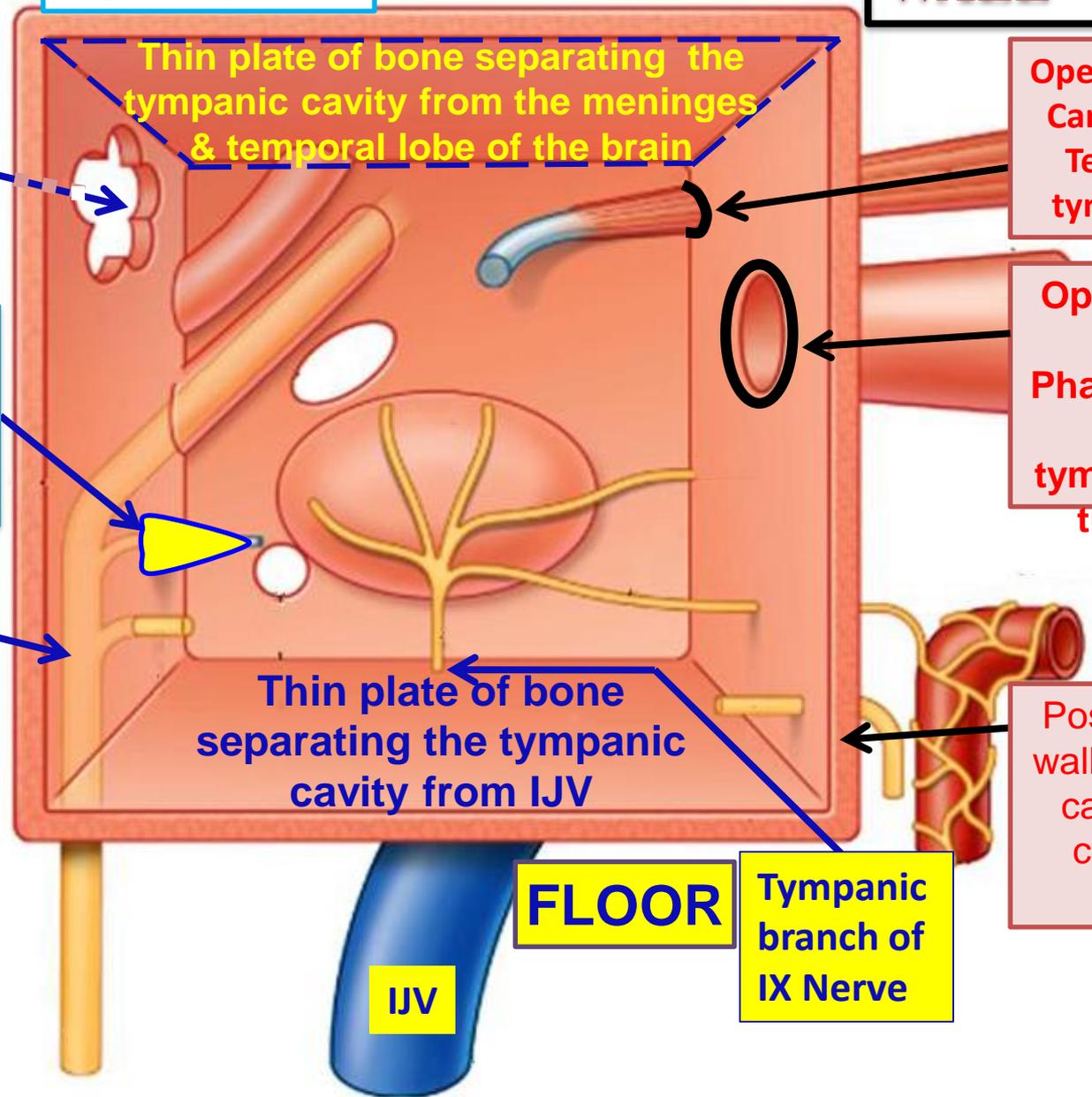
Thin plate of bone separating the tympanic cavity from IJV

Posterior wall of the carotid canal

FLOOR

Tympanic branch of IX Nerve

IJV



Medial wall

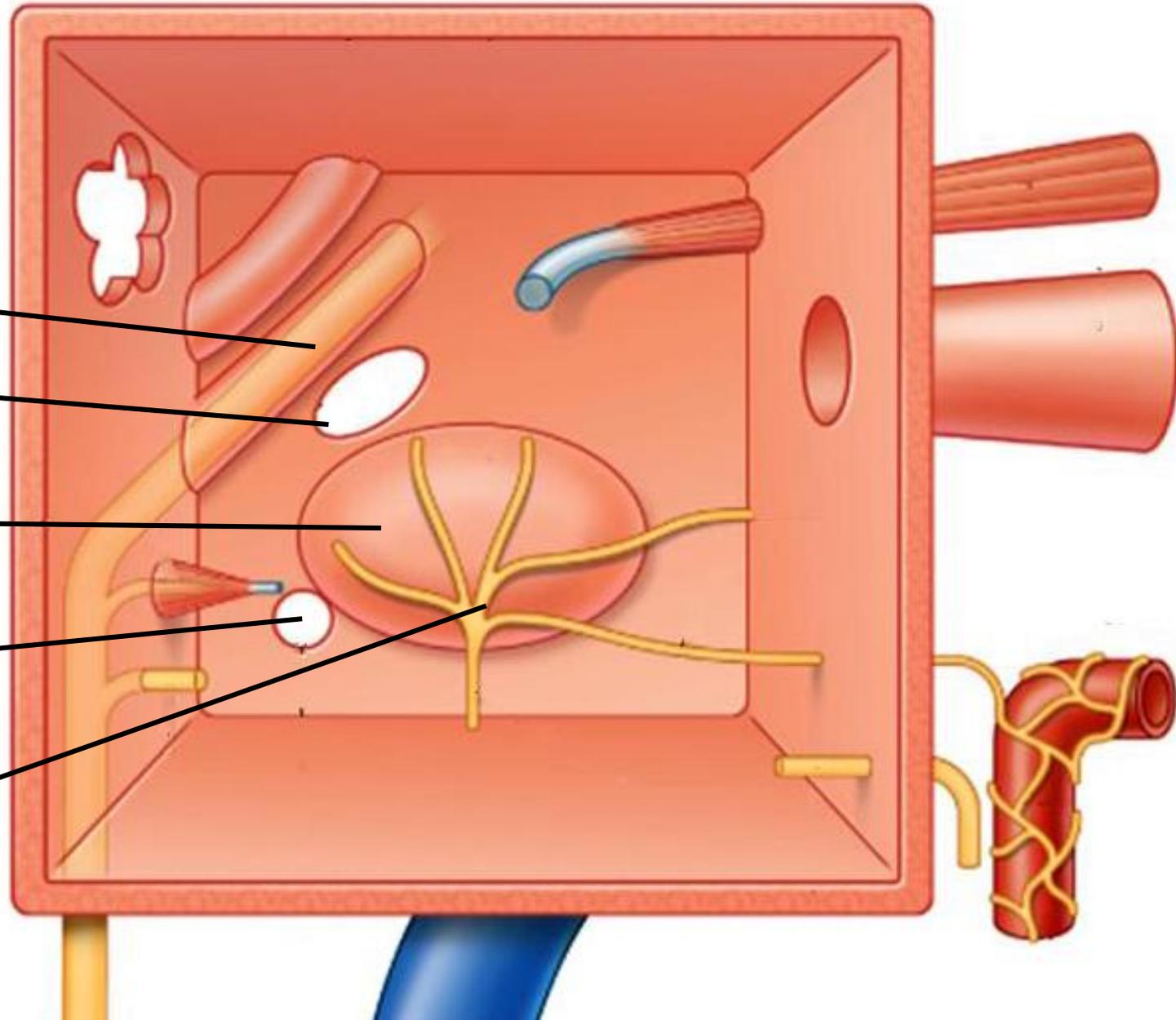
Horizontal part
of facial canal

Oval window

Promontory

Round window

Tympanic
plexus

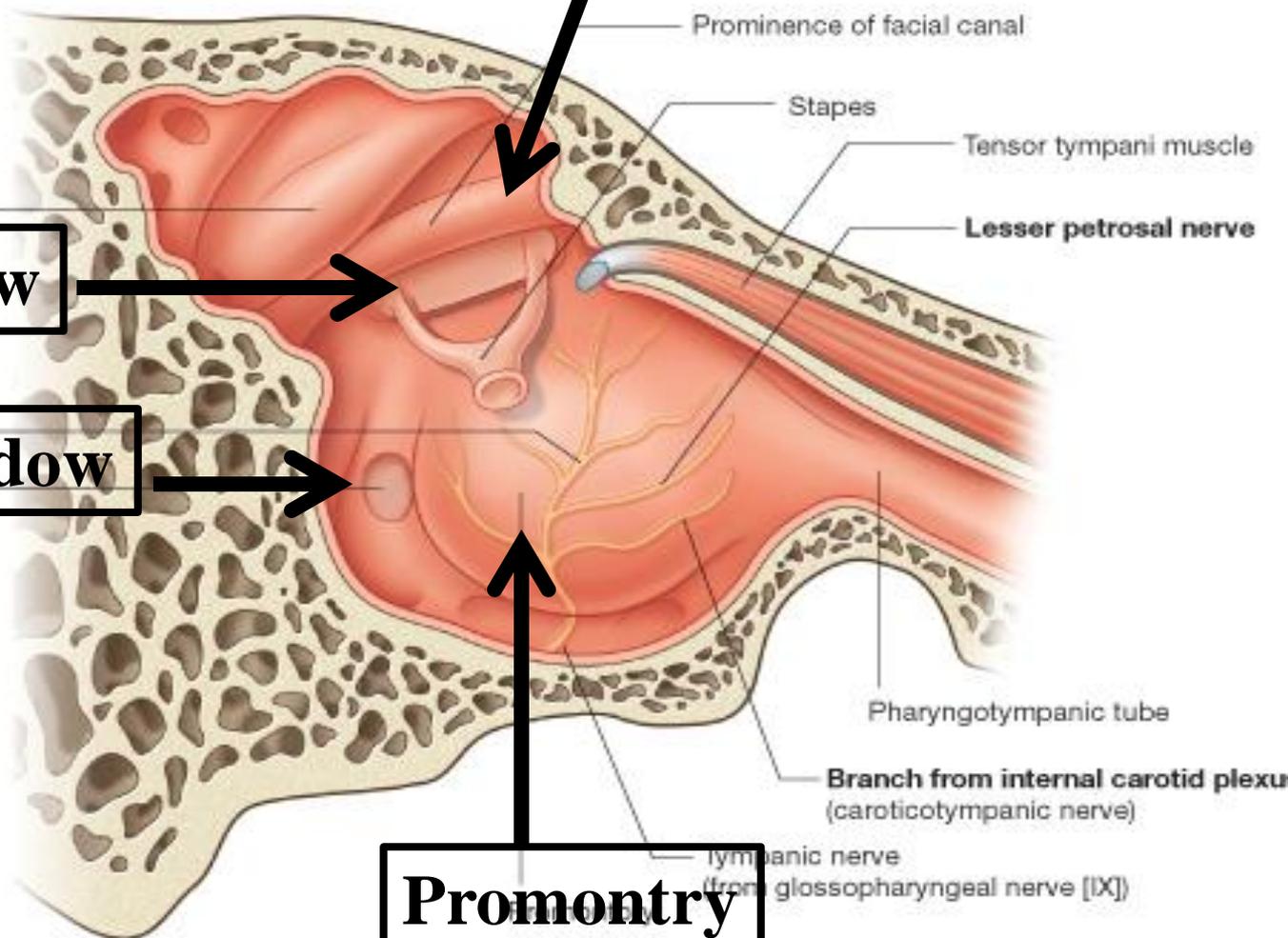


Facial Canal Prominence

Oval Window

Round window

Promontory



Nerve supply of the middle ear

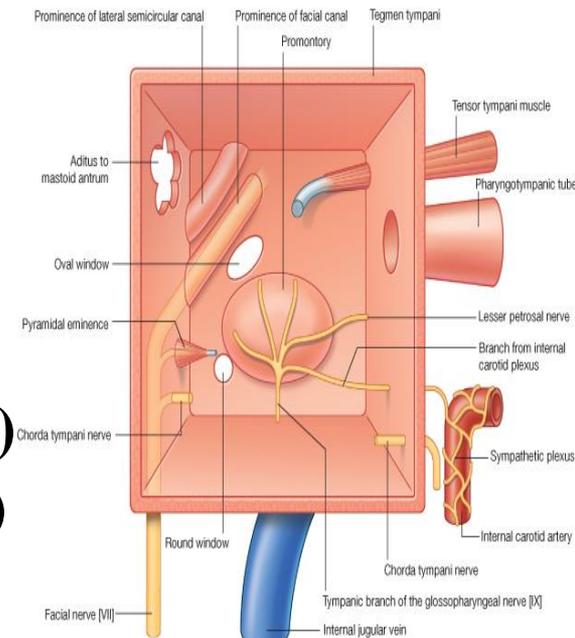
- The nerves supplying the middle ear form a plexus on the promontory **THE TYMPANIC PLEXUS.**

- **The following nerves share in the plexus:**

- 1- Tympanic nerve, br. From the glossopharyngeal nerve.
- 2- Superior caroticotympanic (sympathetic)
- 3- Inferior caroticotympanic. (sympathetic)

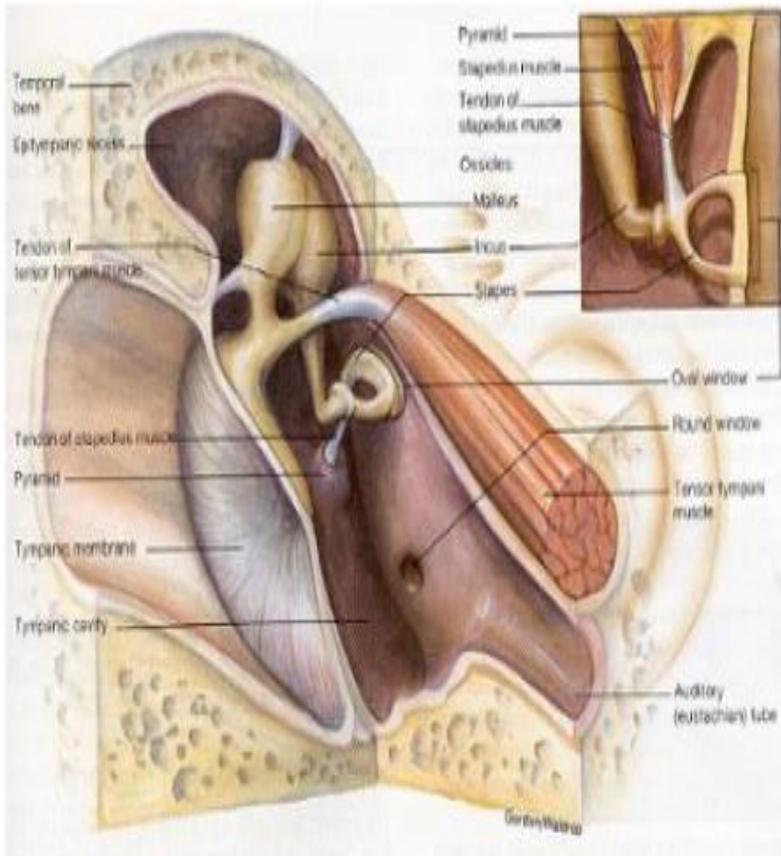
- **The plexus gives the following branches:**

- 1-Branches to the tympanic cavity, auditory tube, mastoid antrum and mastoid cells.
- 2- Lesser petrosal N. (It forms the parasympathetic root of the otic ganglion.)

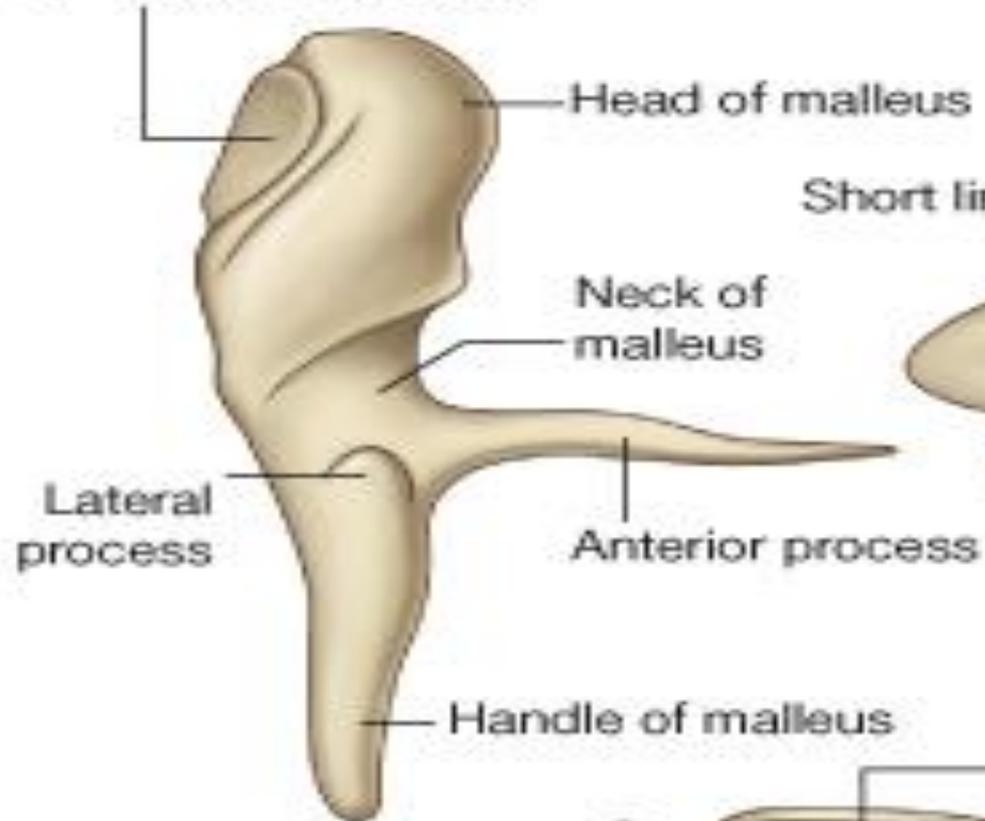


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Three Ossicles

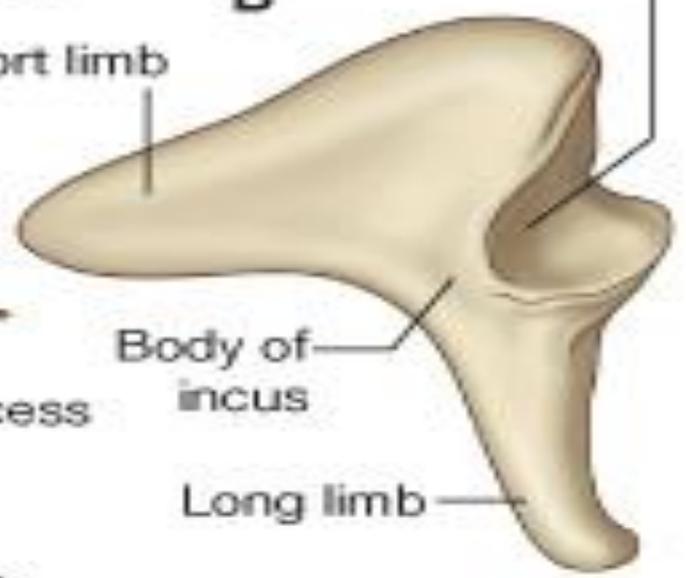


A Incus articulation

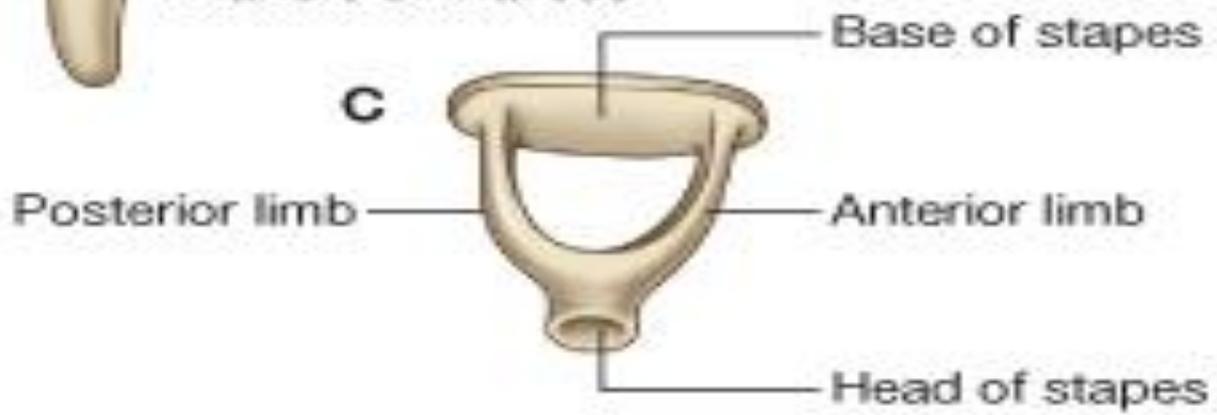


Malleus articulation

B

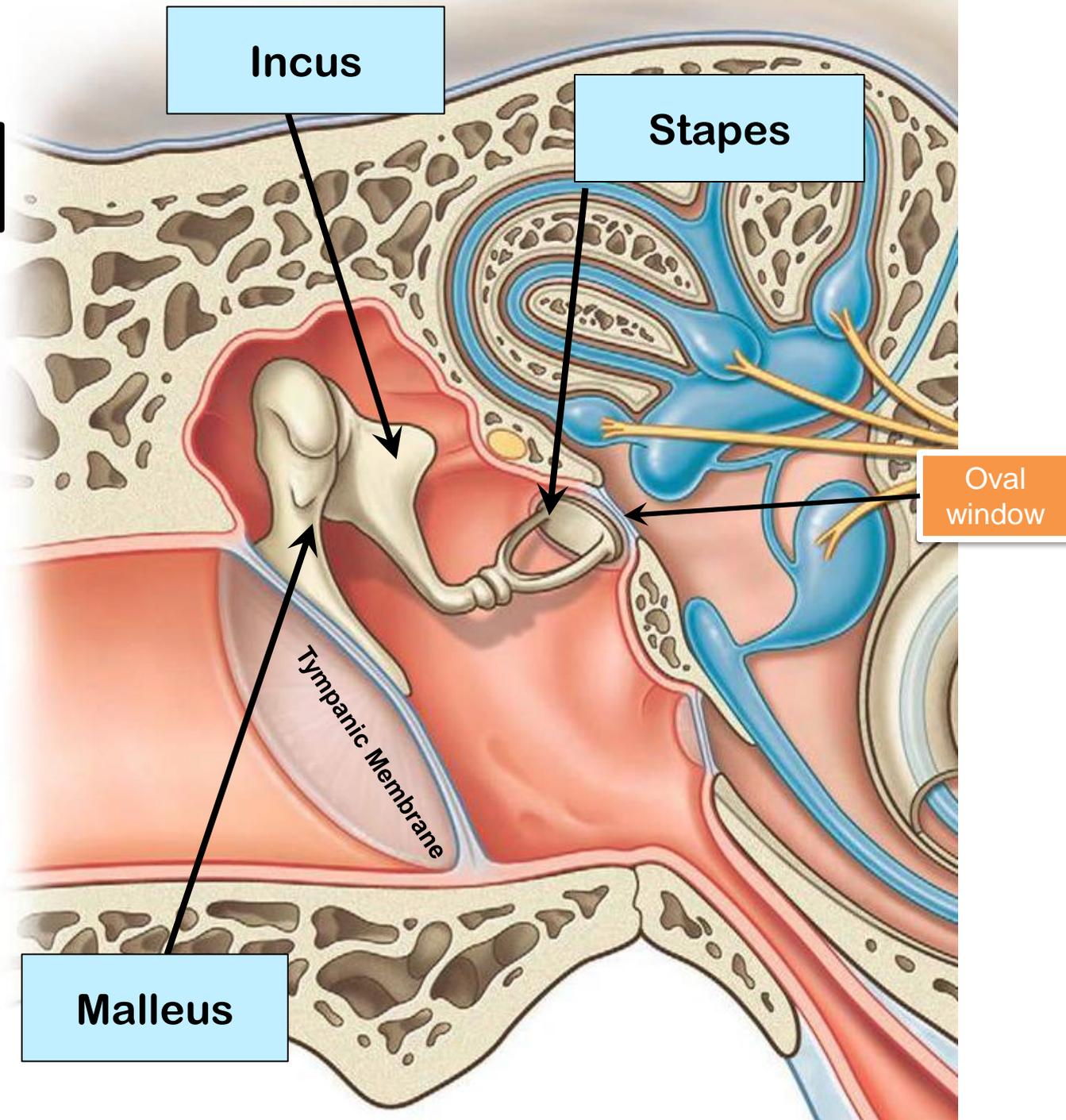


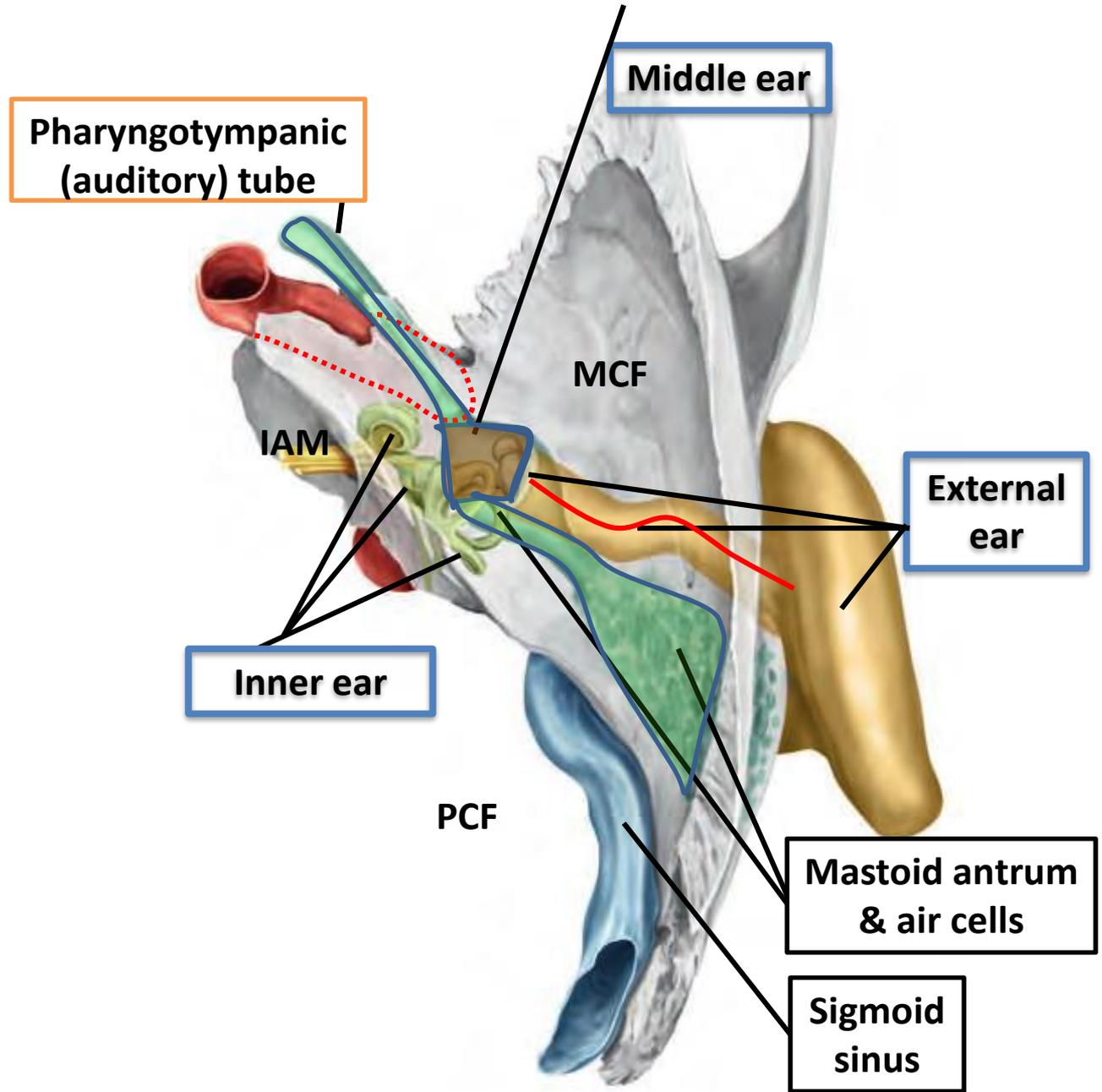
C



Ossicles

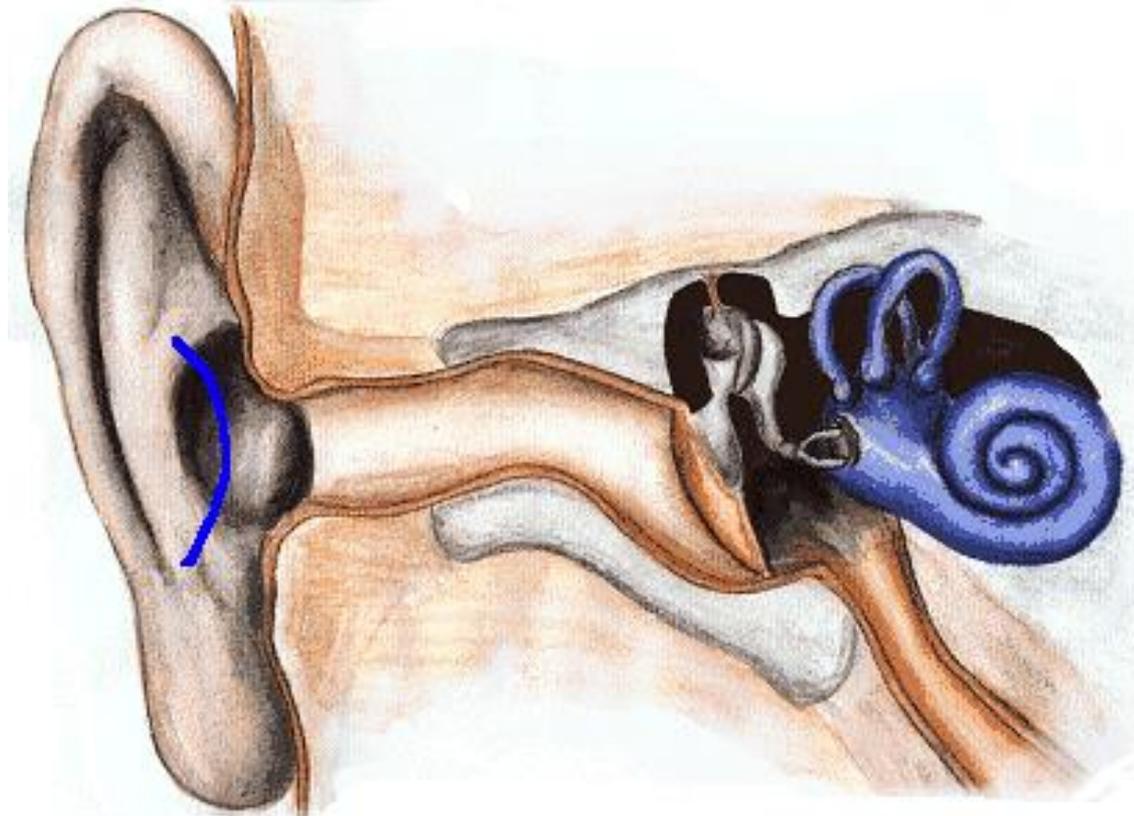
- **Malleus** is fixed to the inner surface of the tympanic membrane.
- **Incus** articulates with malleus and stapes.
- **Stapes** closes the oval window of inner ear.





Clinical notes

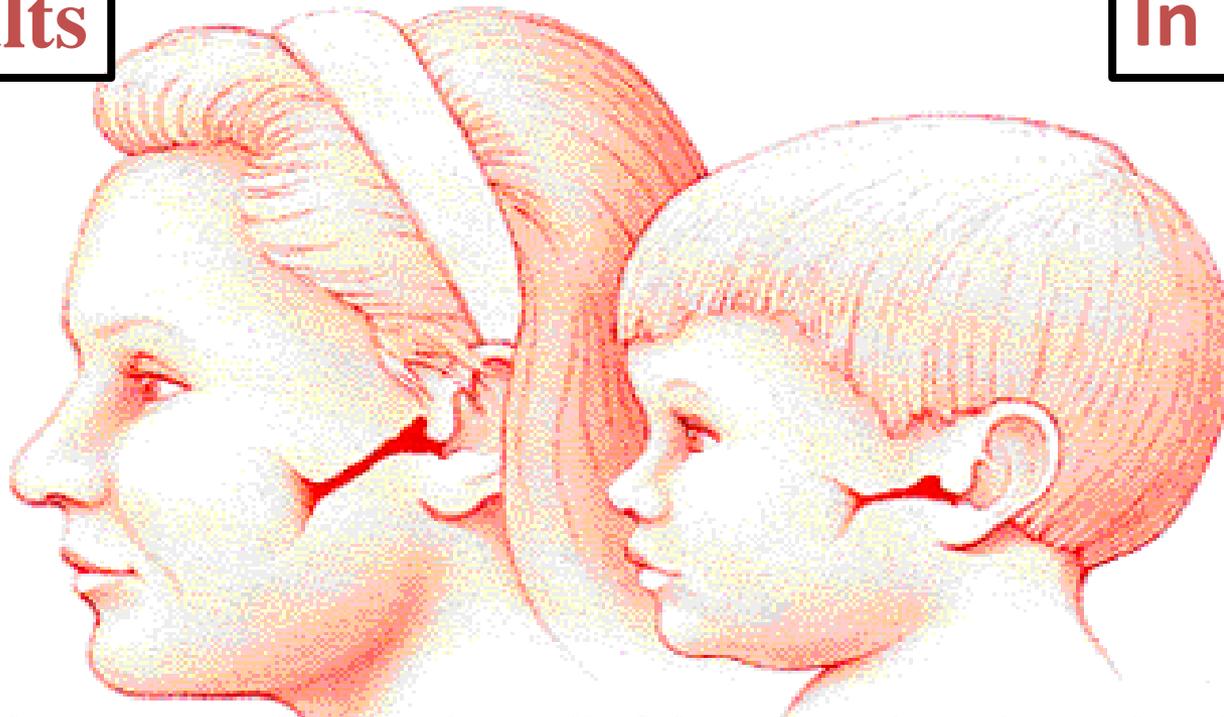
Sound waves causes vibration of the tympanic membrane. The ossicles transmit the vibrations to the oval window, which transmits them to the fluid column of the inner ear.



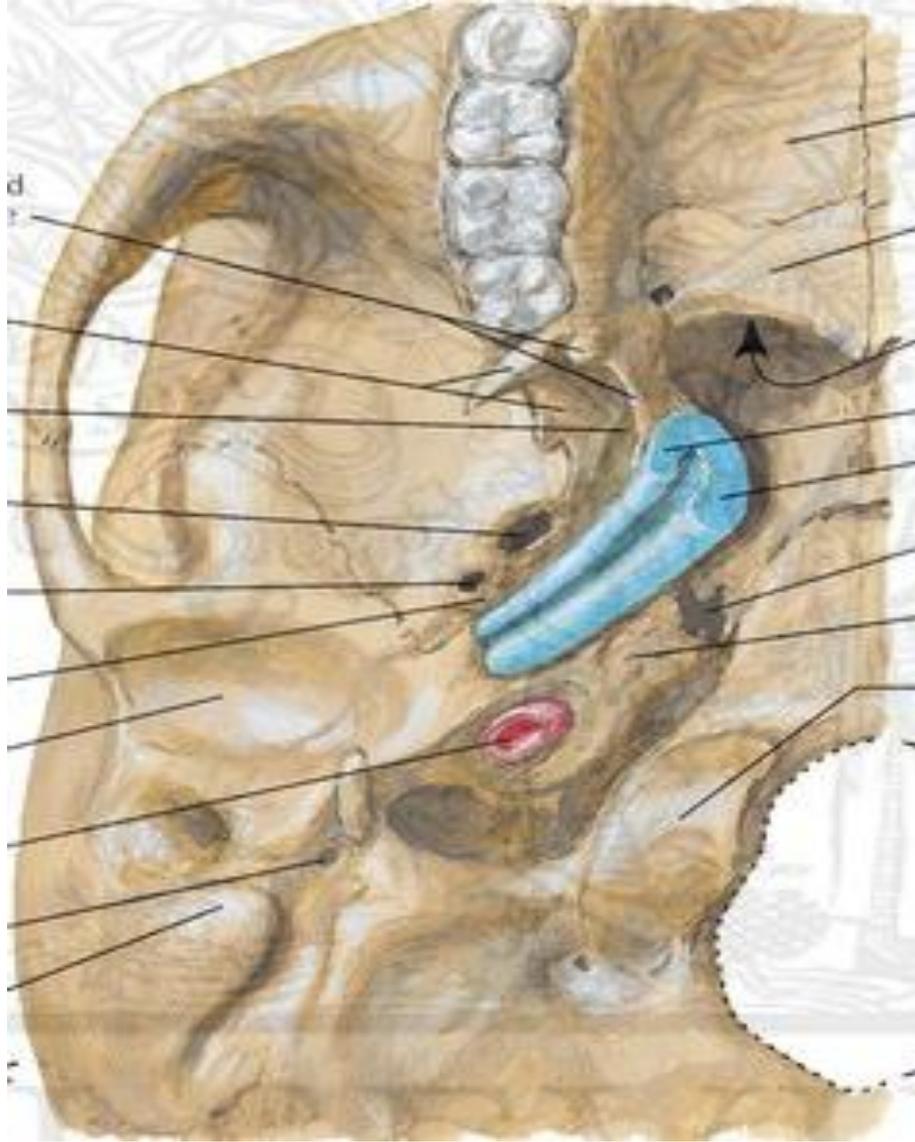
PHARYNGOTYMPANIC TUBE

In Adults

In Infants

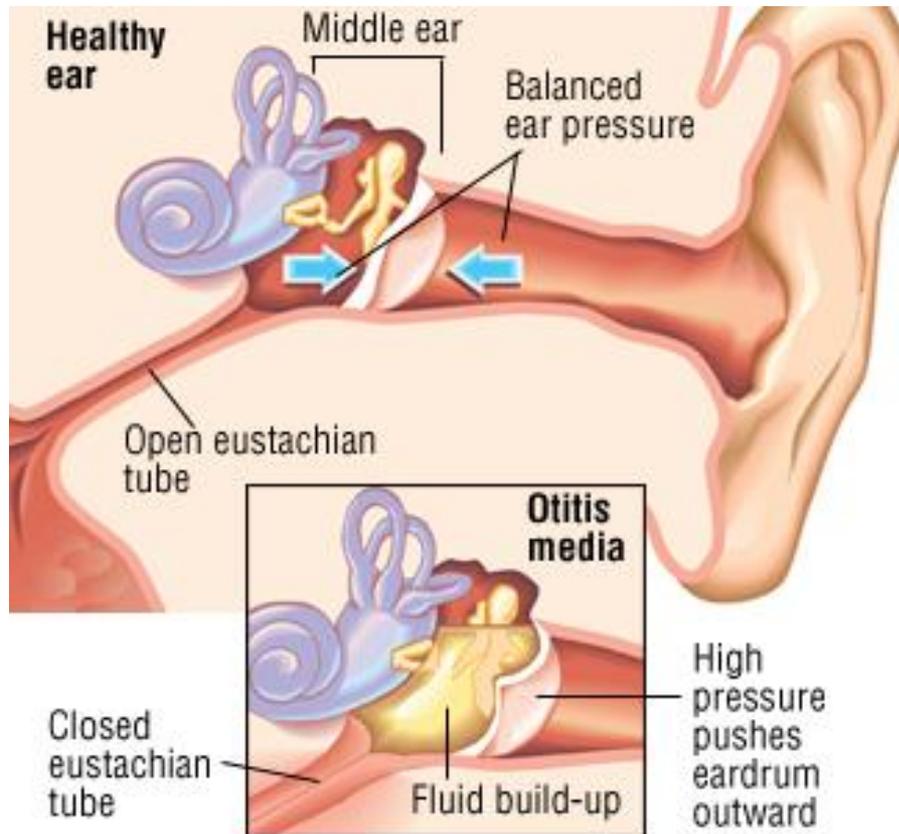


The auditory tube connects the anterior wall of the tympanic cavity to the pharynx. Its posterior third is bony, and its anterior two thirds is cartilaginous. It serves to equalize air pressures in the tympanic cavity and the pharynx.



CLINICAL NOTES

Otitis Media



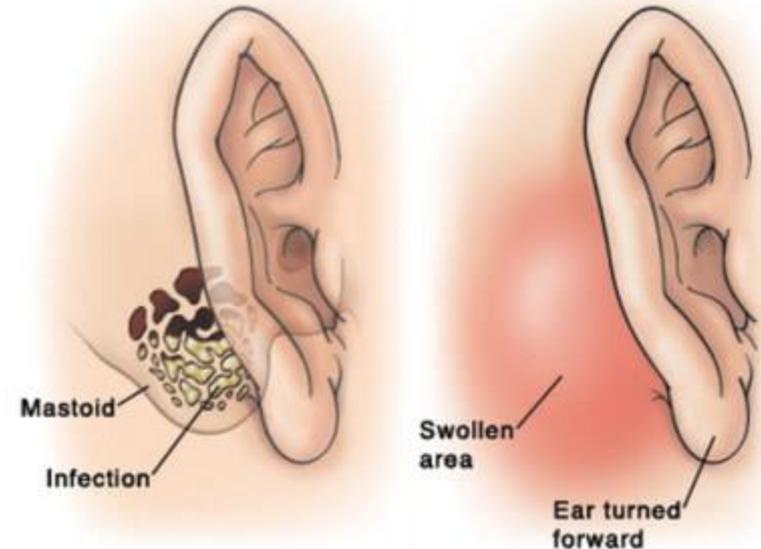
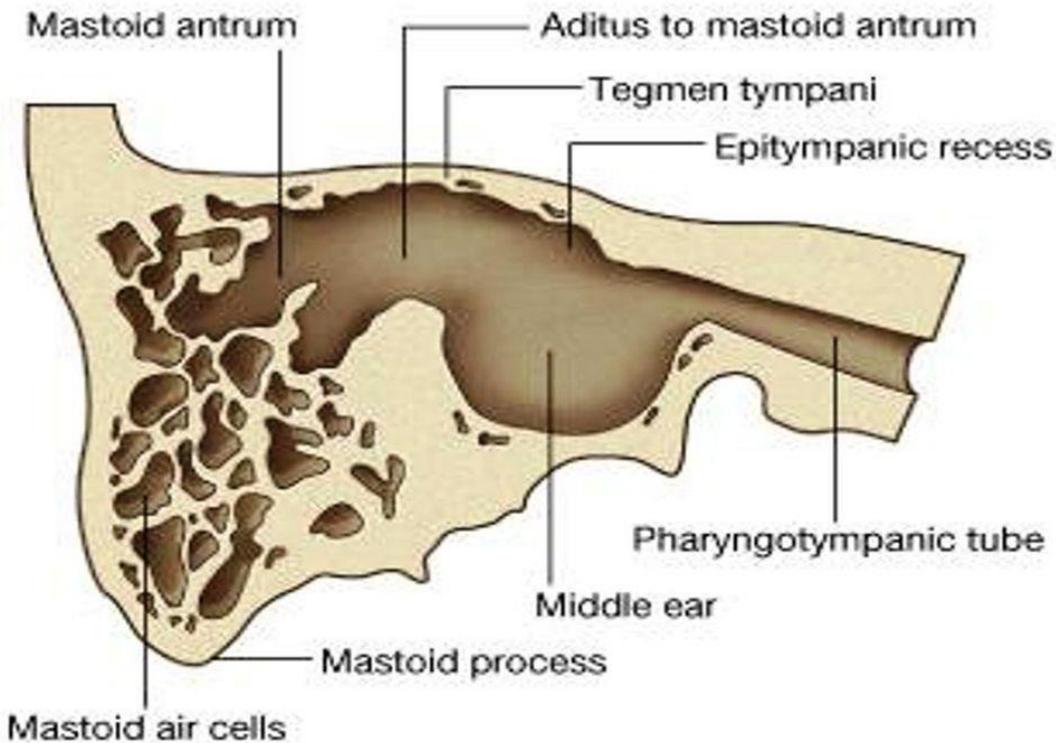
Pathogenic organisms can gain entrance to the middle ear by ascending through the auditory tube from the nasal part of the pharynx. Acute infection of the middle ear (otitis media) produces bulging and redness of the tympanic membrane.

Mastoid Antrum

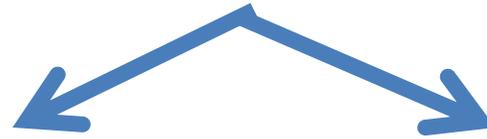
The mastoid antrum lies behind the middle ear. It communicates with the middle ear by the aditus

Inadequate treatment of otitis media can result in the spread of the infection into the mastoid antrum and the mastoid air cells (acute mastoiditis).

A spread of the infection in this direction could produce a meningitis and a cerebral abscess.

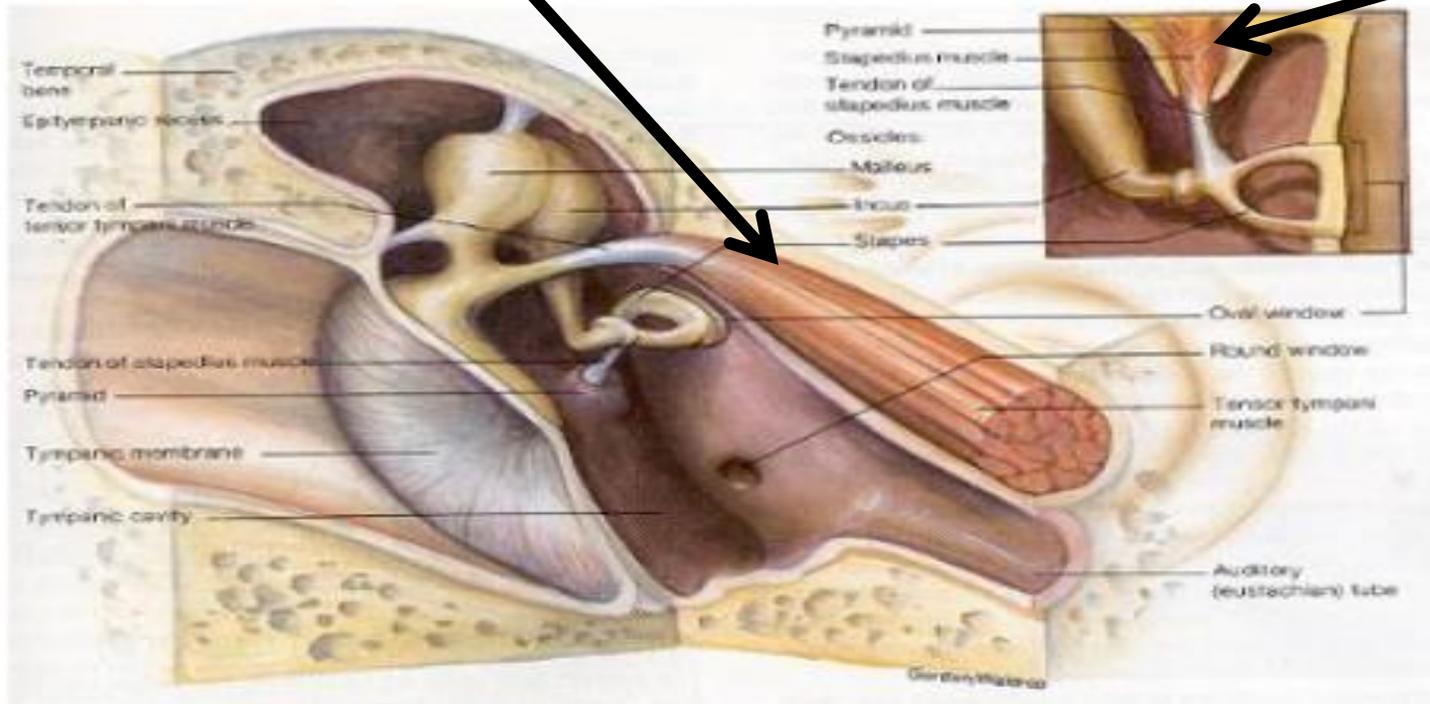


Muscles in the middle ear

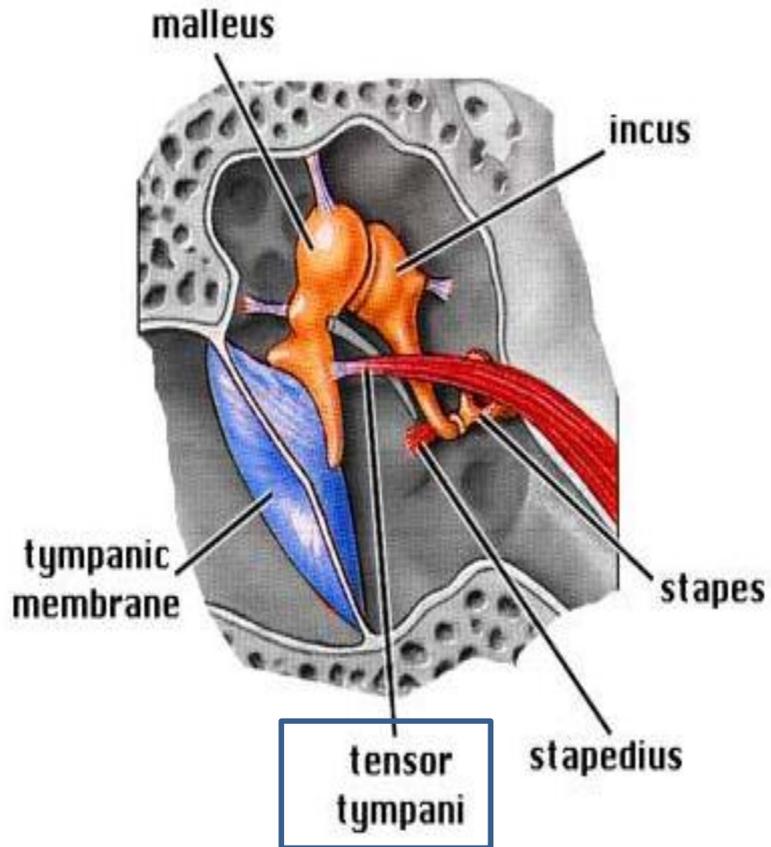


Tensor Tympani M.

Stapedius M.



**Auditory Ossicles
and associated muscles**



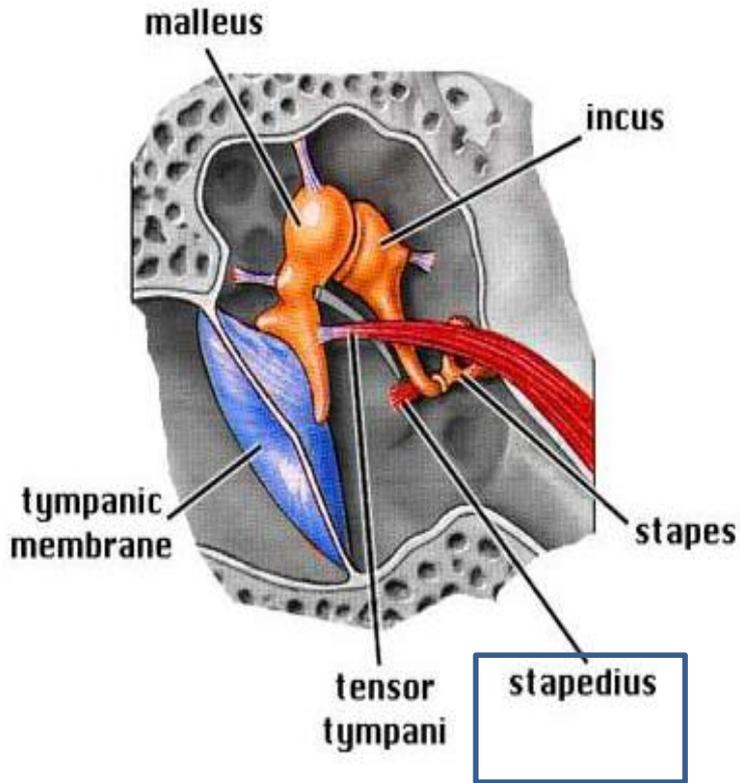
Tensor tympani Muscle

**Arises from the wall of
auditory tube**

**It is inserted to the malleus
and acts to tense the
tympanic membrane, so reducing
the effectiveness of sound
transmission, to protect the inner
ear during loud sounds.**

**innervation from a
branch of the mandibular
nerve (V3).**

Auditory Ossicles and associated muscles



Stapedius Muscle

It is the **smallest skeletal muscle** in the human body.

Arises from the pyramid

It is **connected to the stapes** when it contracts, it **reduces the action of the stapes** (i.e., it reduces amplification)

contracts just before speaking and chewing because our own speaking and chewing actually could be loud enough to damage the sensitive mechanisms of the inner ear.

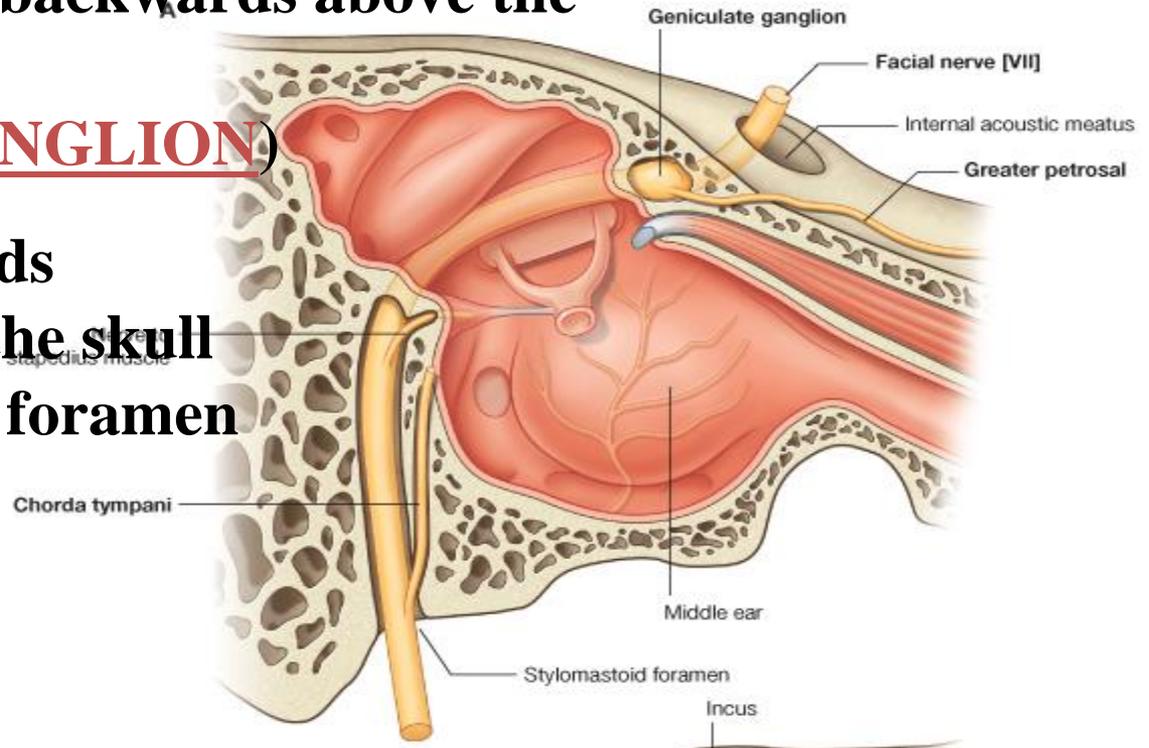
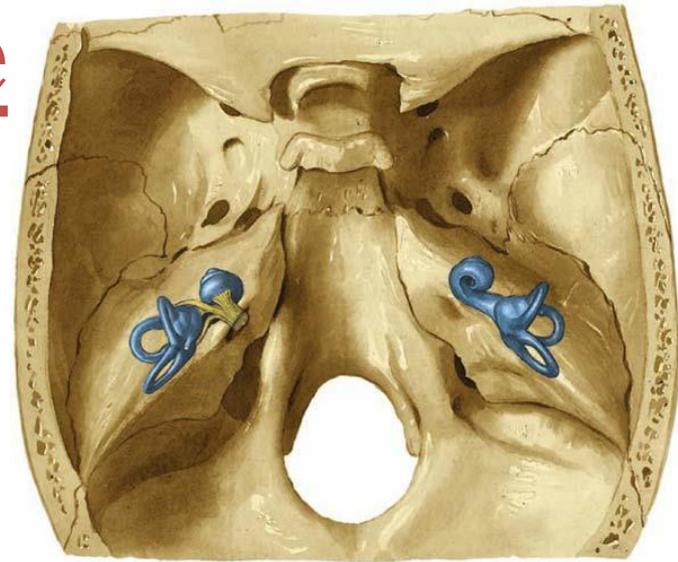
innervated by a branch of the *Facial Nerve (CN VII)*.

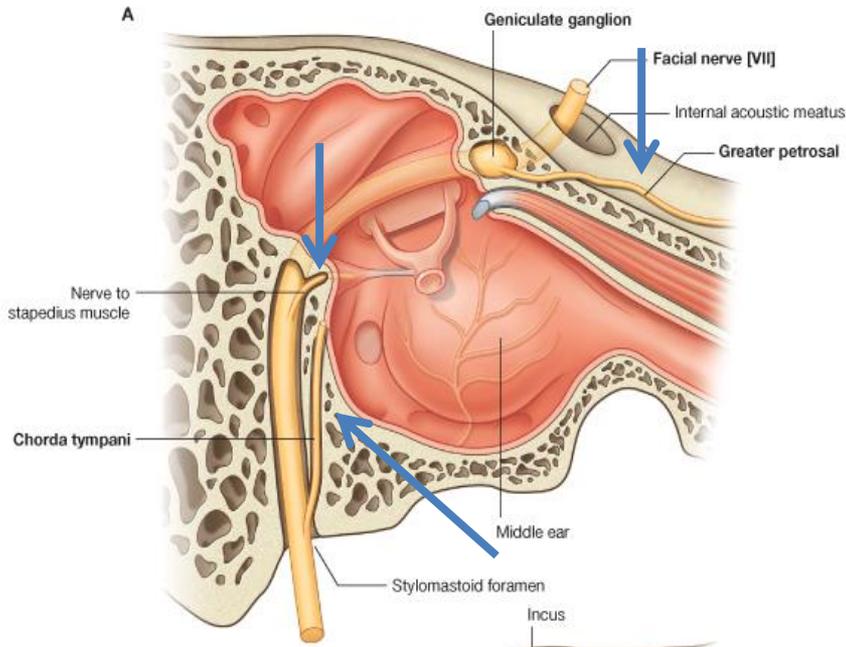
Facial Nerve

- It leaves the cranial cavity by passing through the internal auditory meatus.
- It pierces the bottom of the meatus
- It passes laterally for short distance
- then bends sharply backwards above the promontory

(GENICULAR GANGLION)

Then, it goes downwards
Vertically to go out of the skull
From the stylomastoid foramen





Branches:

1- Greater Petrosal nerve
Out of the geniculate ganglion

2-Nerve to Stapedius M

3-Chorda Tympani

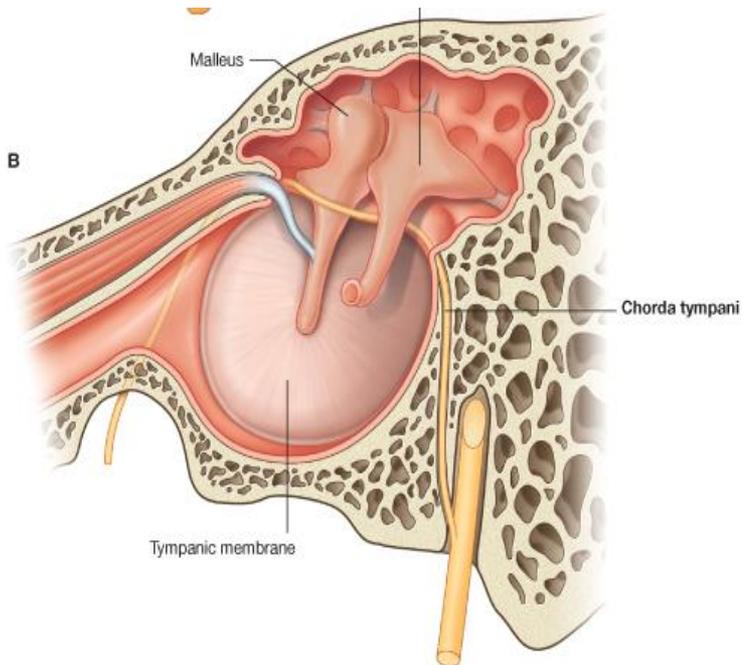
After leaving the stylomastoid foramen

1- Posterior auricular N.

2- Digastric Br.

3- Stylohyoid Br.

4- five terminal Brs in the face





Thank you