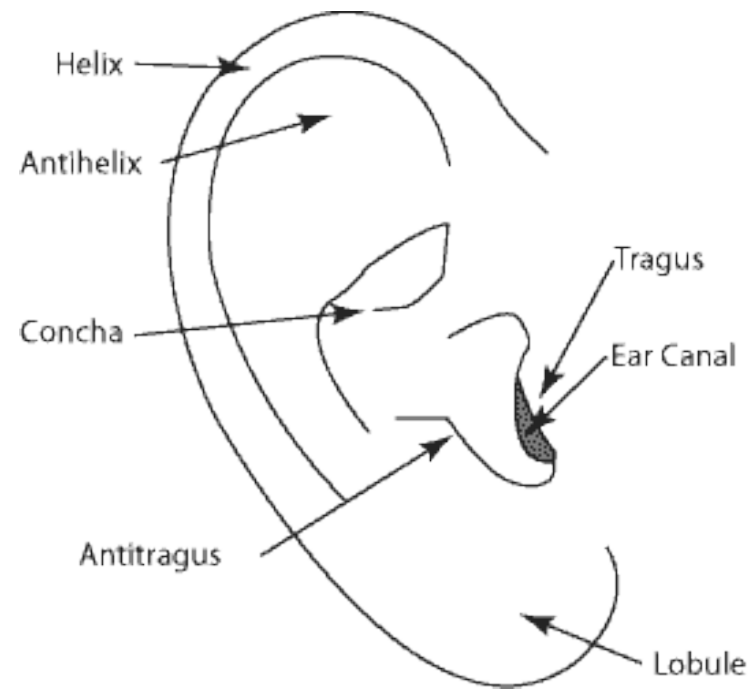
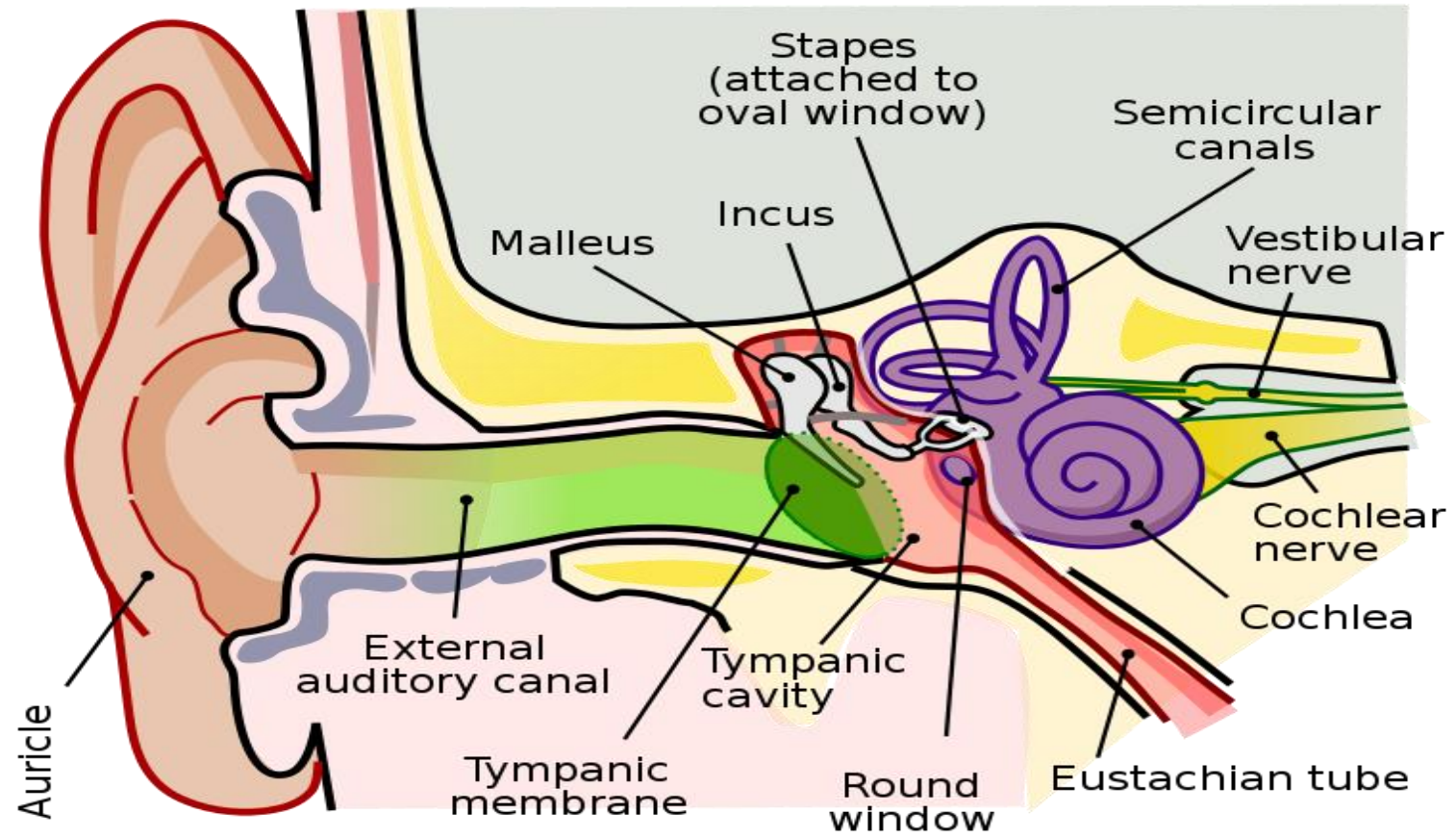


# Ear

**Dr.Priti Acharya**

# Parts of outer Ear





# Introduction

Ear is the organ of hearing

It play a importance role in maintain the balance of the body

Ear is divided into 3 main regions

**External ear-** which are concerned with collection transmitting of sound wave to the tympanic membrane

**Middle ear-** is a narrow silt like air filled cavity within the petrous part of temporal bone

**Internal ear** – consist of closed system of fluid filled intercommunicating ,membrane sac and duct called membranous labyrinth

- External Ear

- Auricle(Pinna)
- External auditory canal

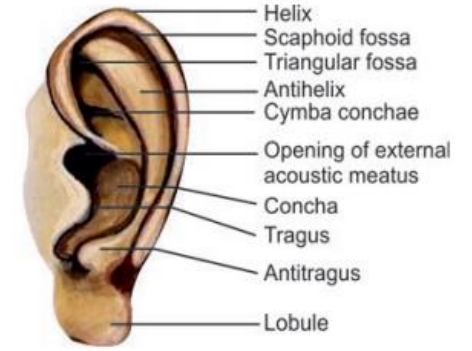
- Middle Ear

- Tympanic membrane(Ear drum)
- Auditory Ossicles
- Oval window
- Eustachian tube

- Inner Ear
- Membranous Labyrinth
- Bony Labyrinth

# External Ear

- **Auricle**
- Is a wave like pattern of projection on the side of head
- Made up of elastic cartilage except pinna
- Lobules of pinna is made of fibro fatty tissue covered with skin
- Play importance role in localization of sound
- It opens into external auditory canal



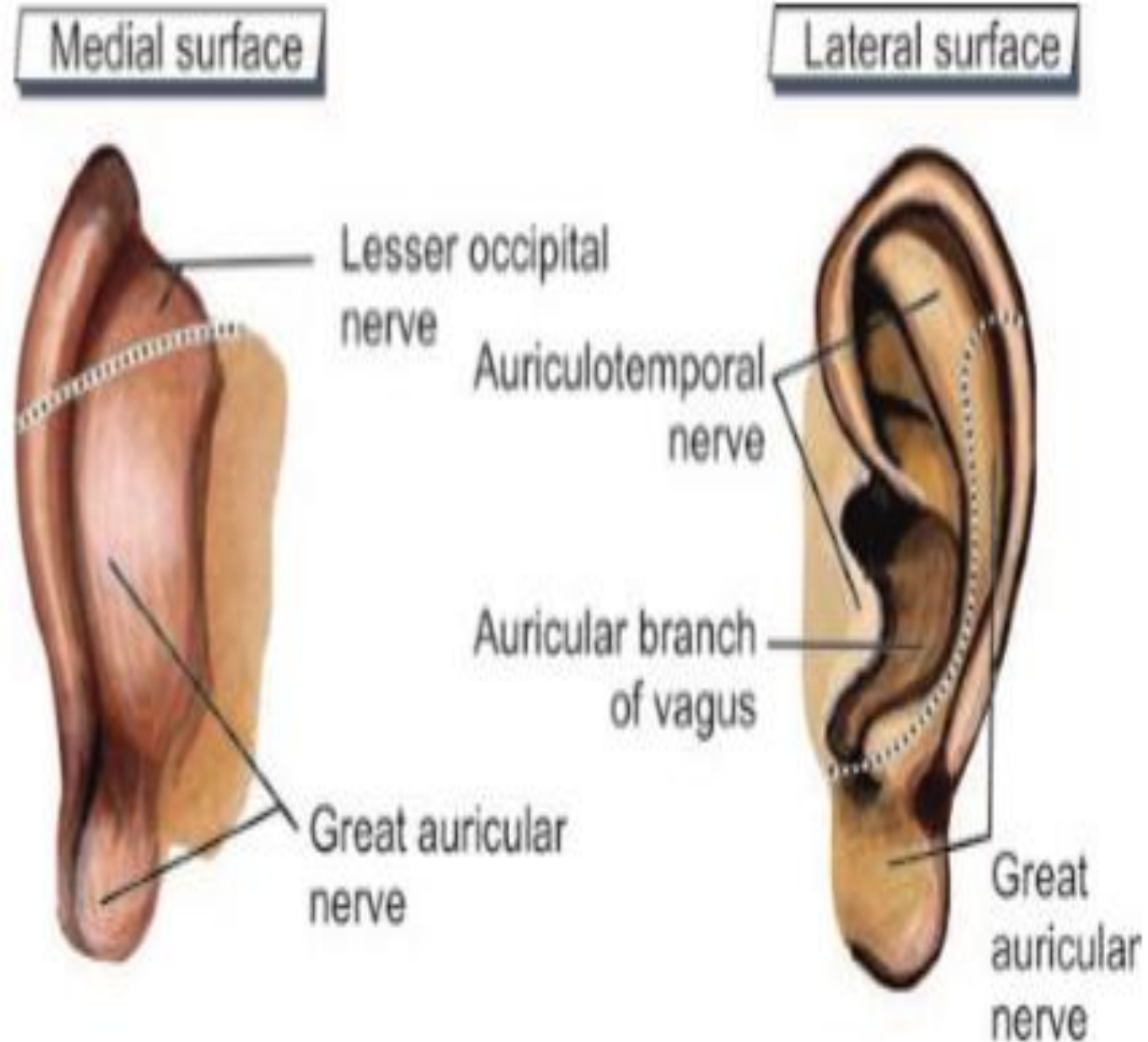
**Fig. 51.2:** Lateral surface of left pinna

# Surfaces of auricle

- lateral (outer)
- And medial surfaces



**Fig. 51.2:** Lateral surface of left pinna





- External auditory canal

- Lies within the temporal bone and connect the ear drum(tympanic membrane)
- Curved tube extend from pinna to ear drum
- It is not a straight tube but it has a typical S shape structure
- Measures- 24mm along its posterior wall
- Contains the ceruminous gland which secrets ear wax

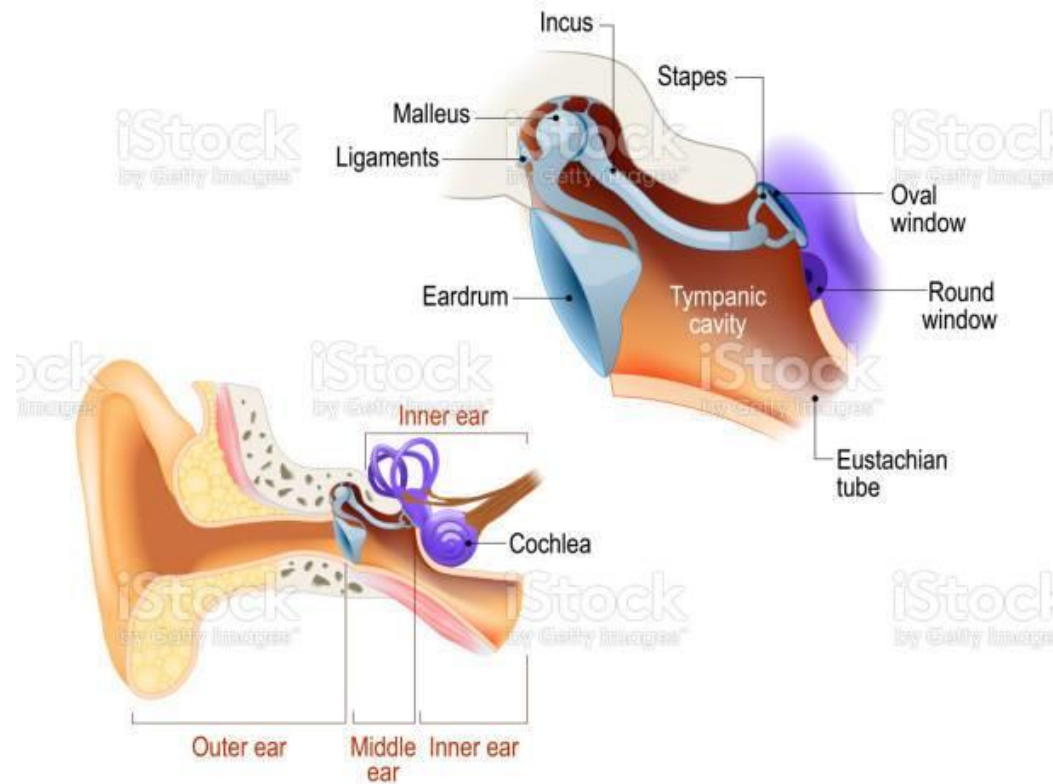
## **Impacted wax**

- Is the condition in which excess wax is deposited as a plug in the meatus.
- The impacted wax may dry up and cause a sense of blocked ear, tinnitus and giddiness.
- Stimulation of auricular branch of vagus by impacted wax may give rise to reflex coughing (ear cough).

# Function of outer ear

- Protection
- Amplification
- Localization

## MIDDLE EAR



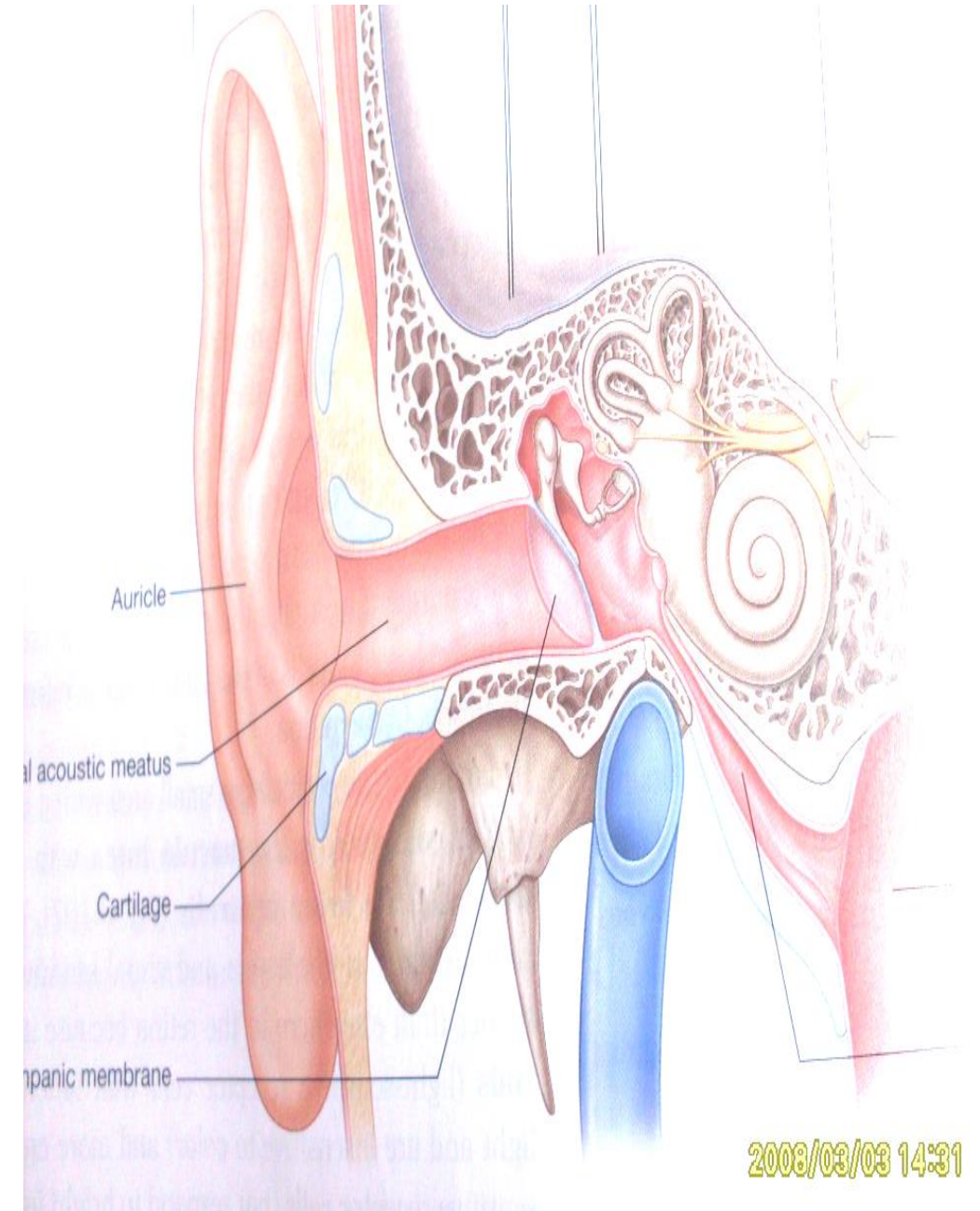
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# Middle ear

- Small filled air filled cavity in temporal bone
- Lined by epithelium
- It is separated by external ear by ear drum
- It is separated by internal ear by oval window
- Two muscle- Tensor tympani, Stapedial muscle
- Three bones( incus, malleus, stapes)

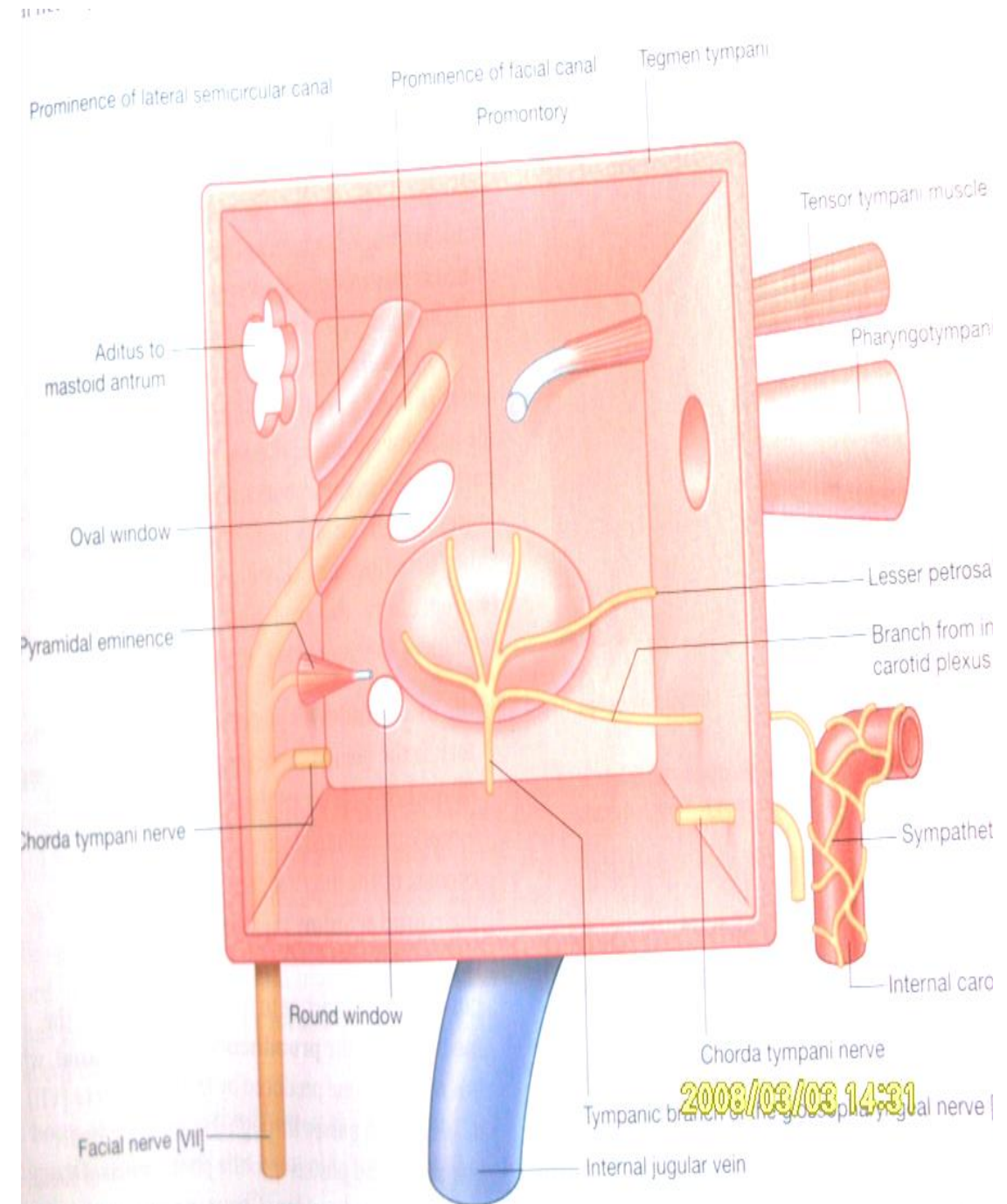
# Middle Ear

- The middle ear is an air-filled space in the petrous temporal bone.
- The middle ear receives atmospheric air from the nasopharynx via the pharyngotympanic tube.



# Wall of middle ear

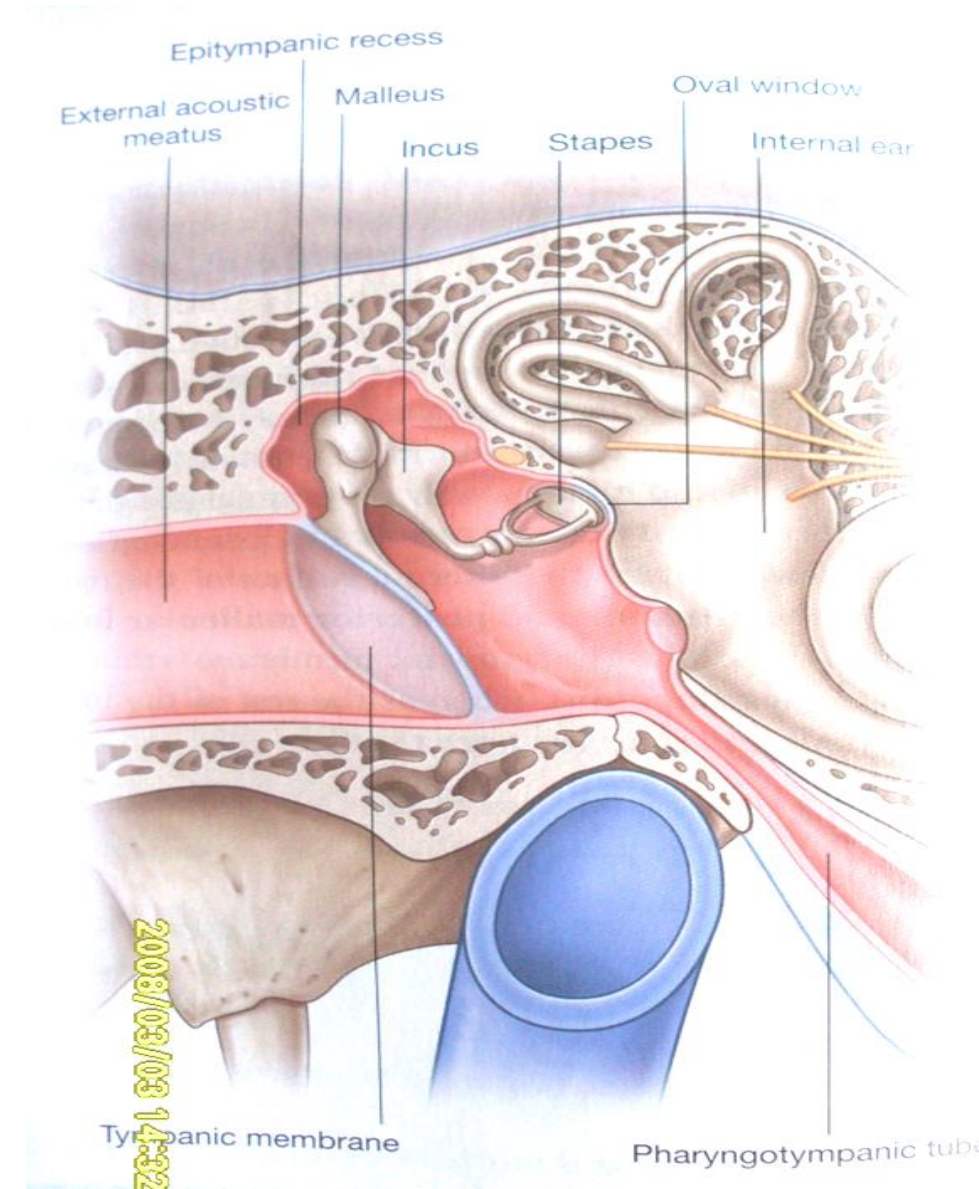
- Roughly cuboidal
- the roof, floor, lateral wall, medial wall, anterior wall, and the posterior wall.





# Roof / Tegmental wall

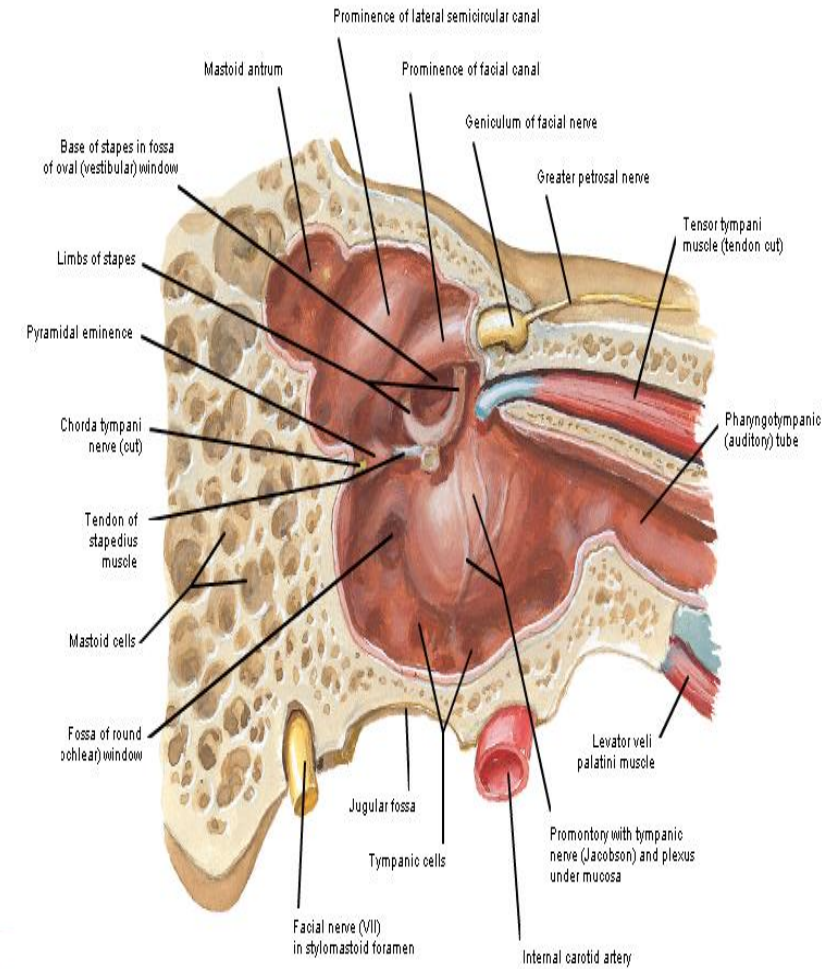
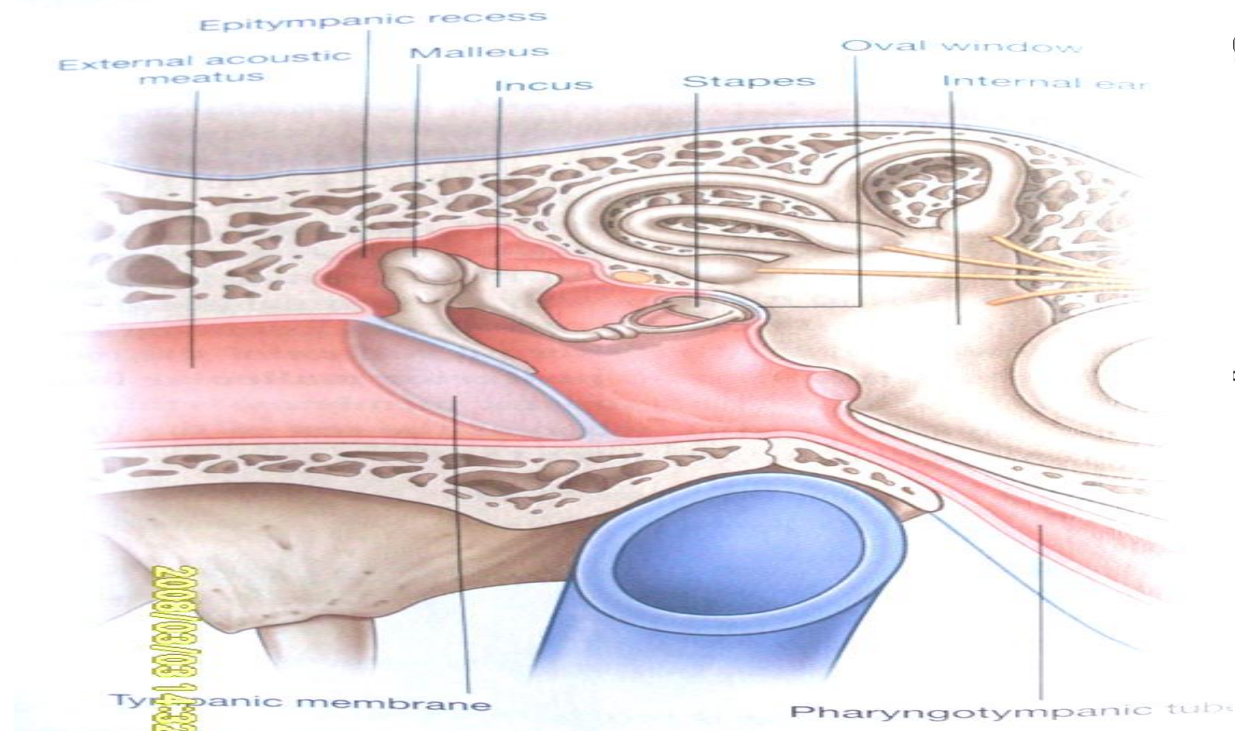
- The tegmen tympani, a thin plate of petrous temporal bone roofs the middle ear.





# Floor/ jugular wall

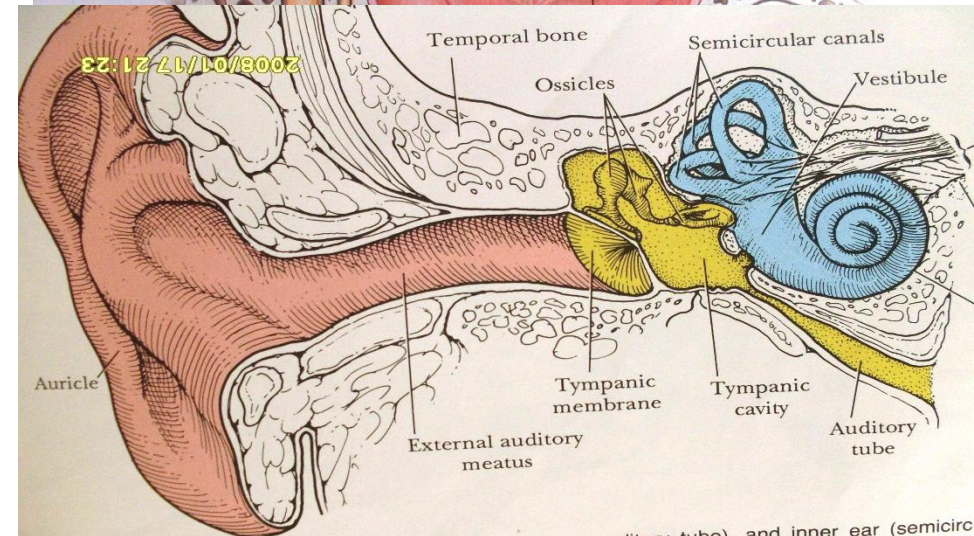
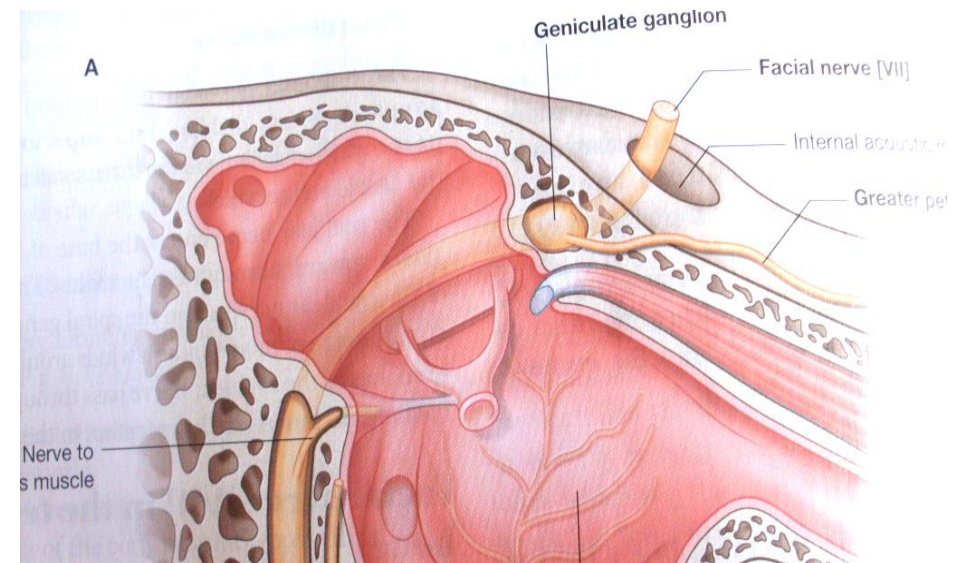
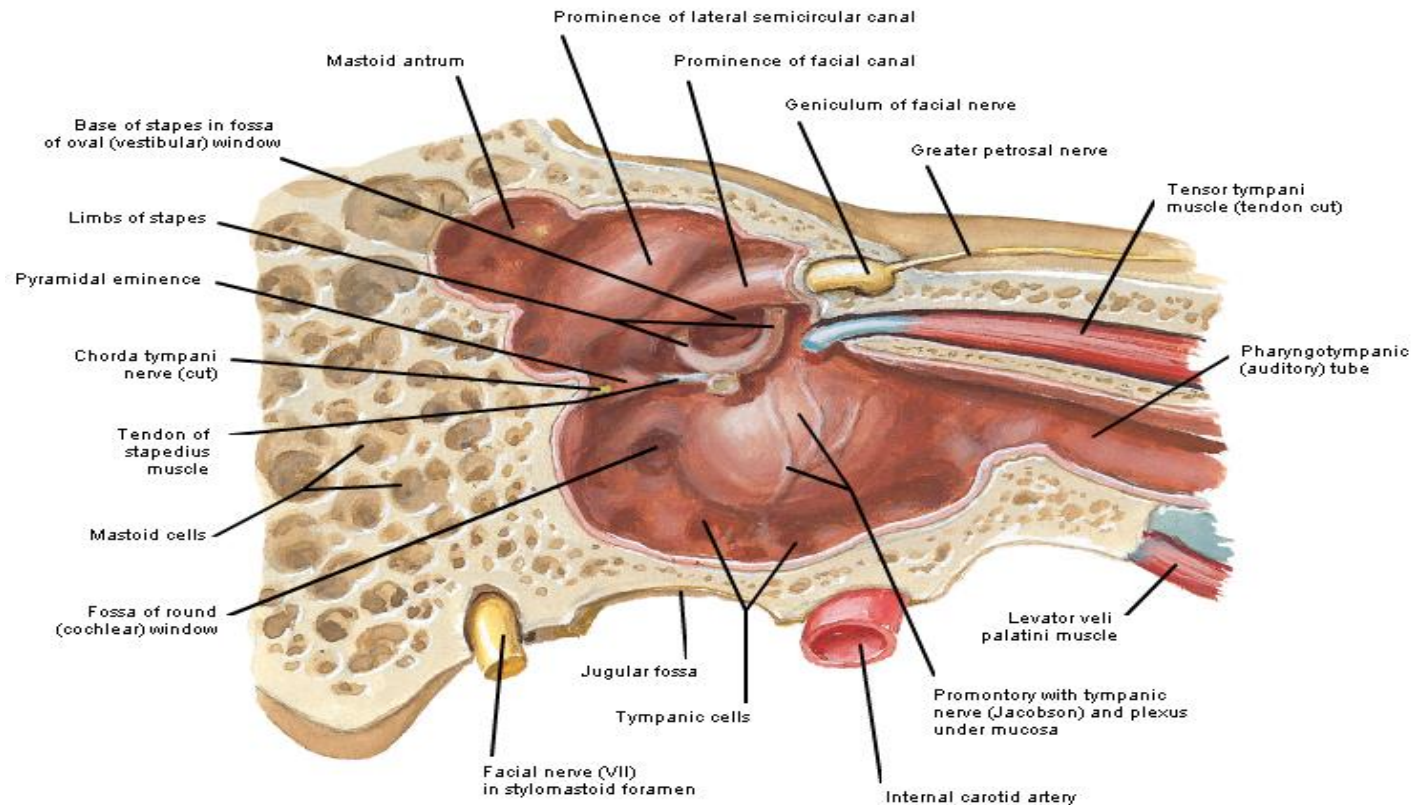
- Formed by the jugular fossa
- Related to sup bulb of internal jugular vein



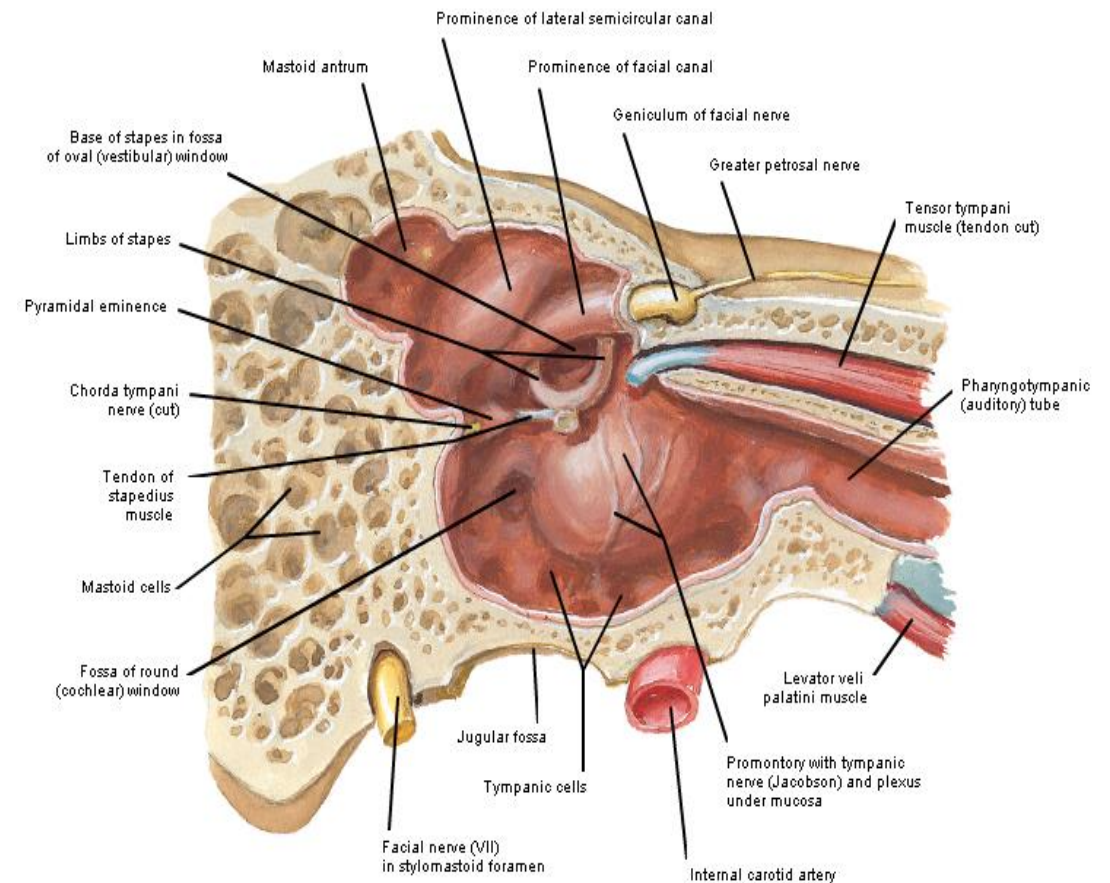
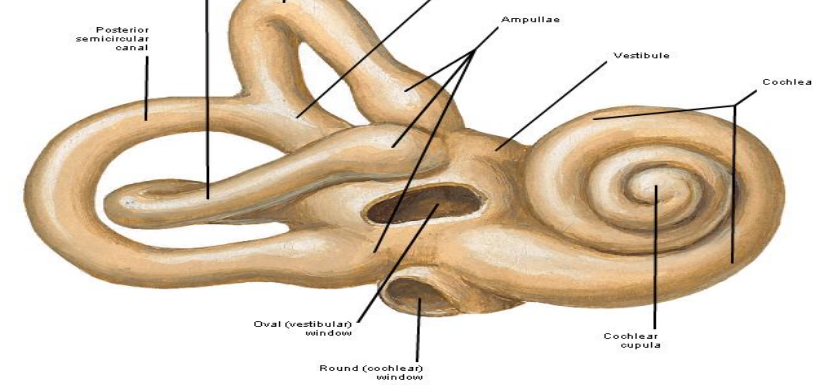


# Medial wall/ labyrinthine wall

- **i. The promontory** is a rounded elevation in the middle of the medial wall.

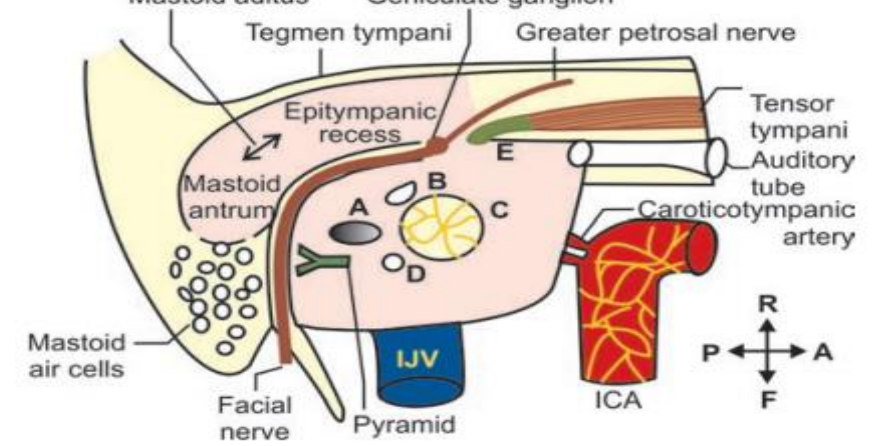


- **ii. The sinus tympani** is a depression posterior to the promontory.
- **iii. The fenestra vestibuli or oval window** Is an opening behind and above promontory
- It is closed by the base of foot plate or base of stapes and the annular ligament

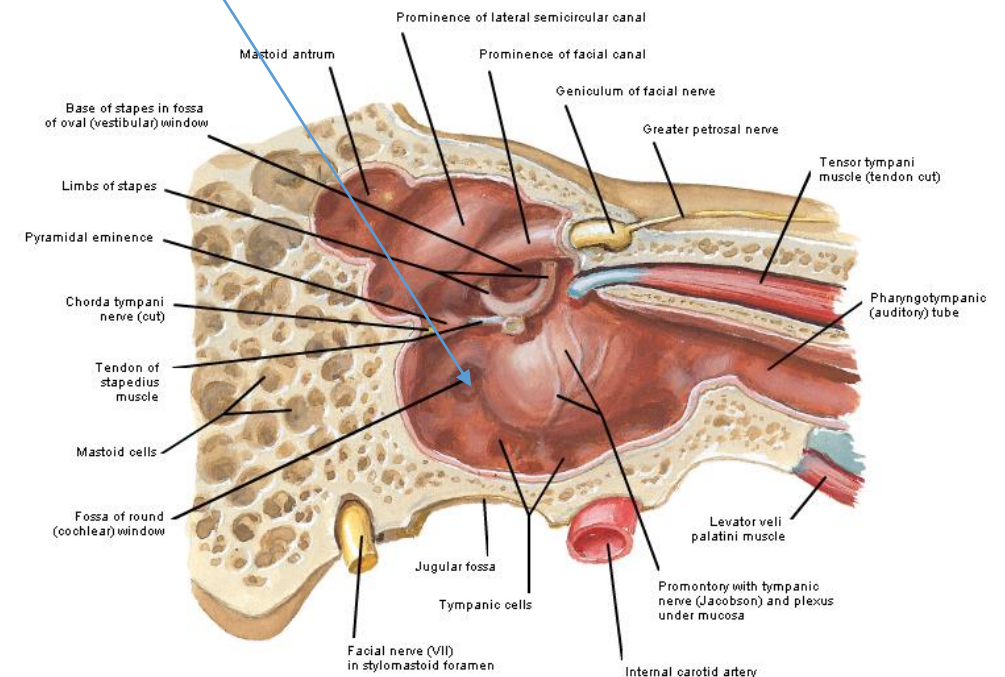




- **The fenestra cochleae or round window**
  - Below and behind promontory
  - Is closed by secondary tympanic membrane.
- 
- **Vertical part of facial nerve exits from stylomastoid foramen**

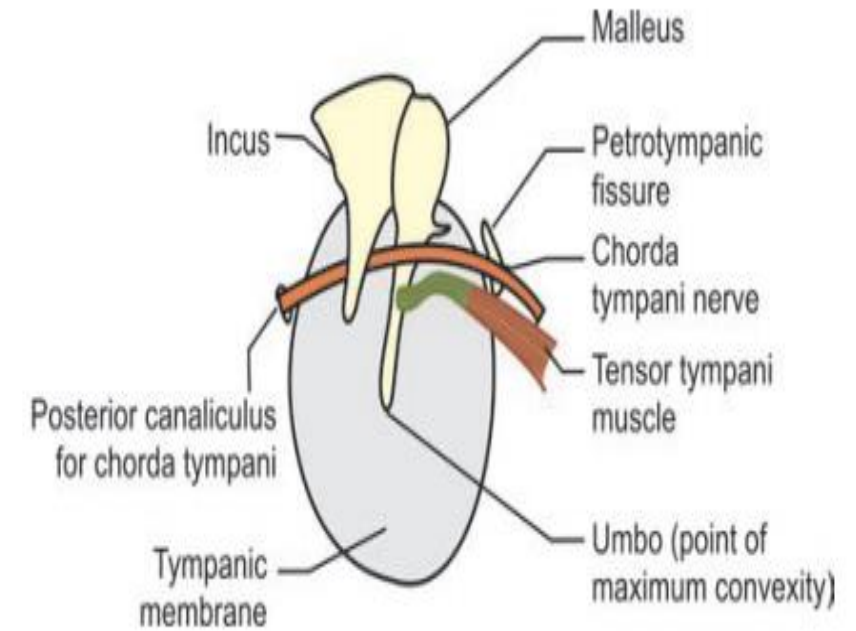


**Fig. 51.4:** Features on the walls of middle ear (A) Sinus tympani; (B) Fenestra vestibuli; (C) Promontory; (D) Fenestra cochleae; (E) Processus trochleariformis (Note the canal of facial nerve on the medial and posterior walls)

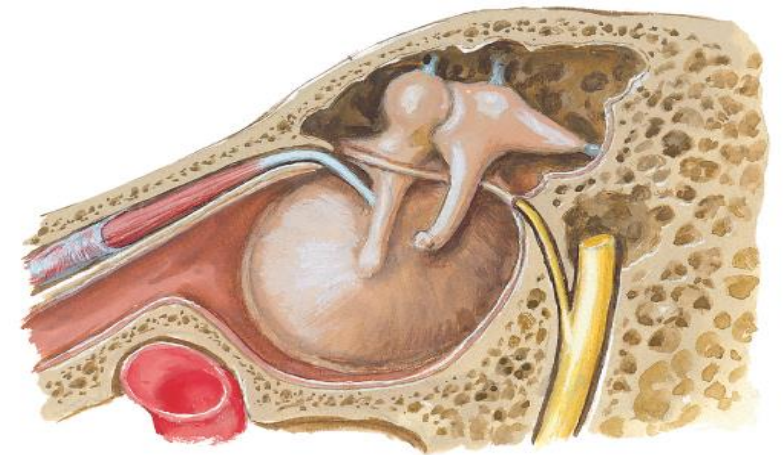


# LATERAL WALL

- Most of it is formed by mucous covered medial **surface of tympanic membrane**
- Oval , semi transparent pearly grey trilaminar membrane
- Separates tympanic cavity from ext acoustic meatus
- Presents convexity towards tympanic cavity
- Gives attachment to handle of malleus which extends up to umbo



**Fig. 51.5:** Medial surface of tympanic membrane as seen through the middle ear



- **ANTERIOR WALL (CAROTID WALL)**

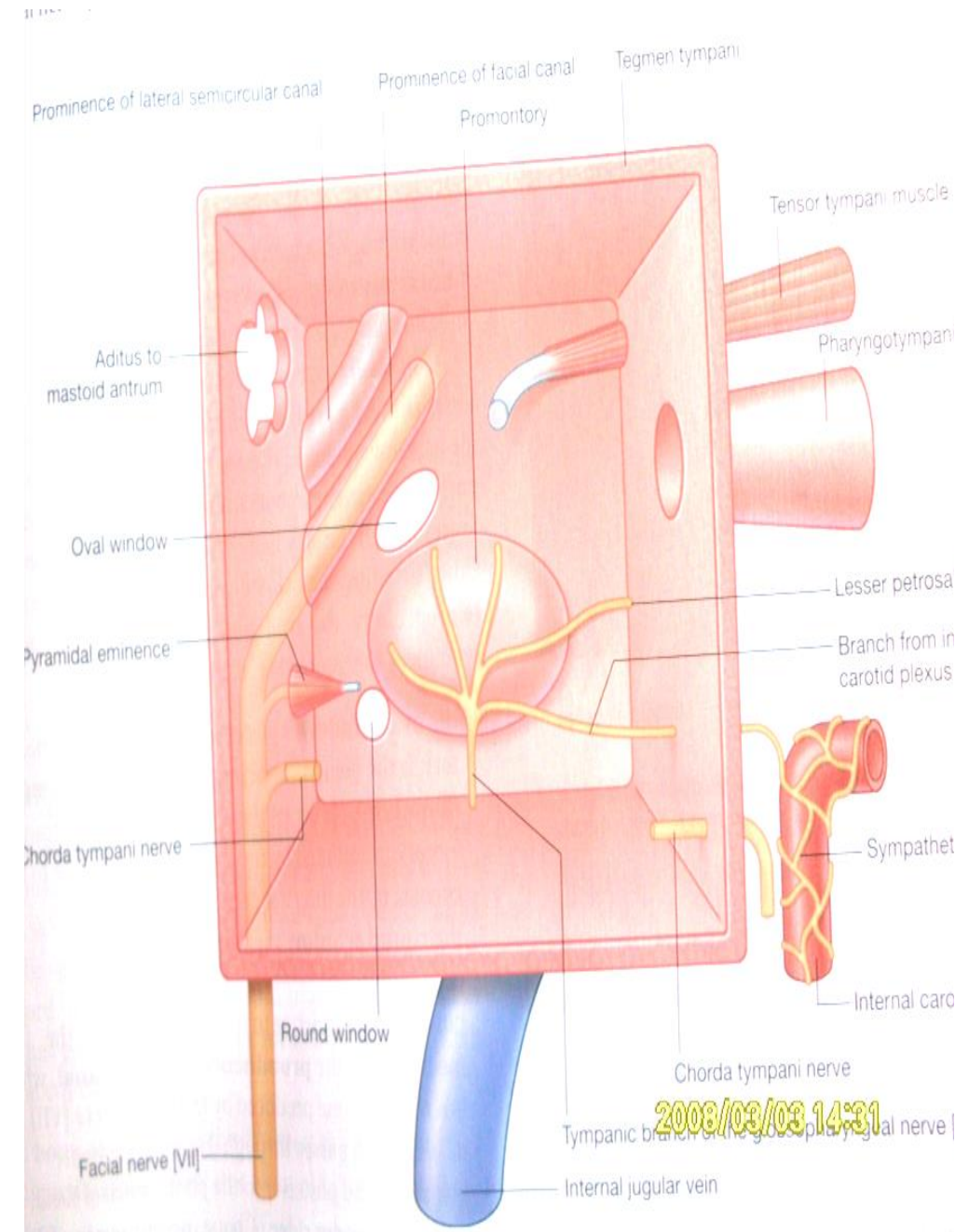
- The anterior wall is narrow due to approximation of medial and lateral walls.

- **Its prominent feature**

**upper part-is** a large opening of the pharyngotympanic tube.

- Above this the canal for the tensor tympani muscle opens.

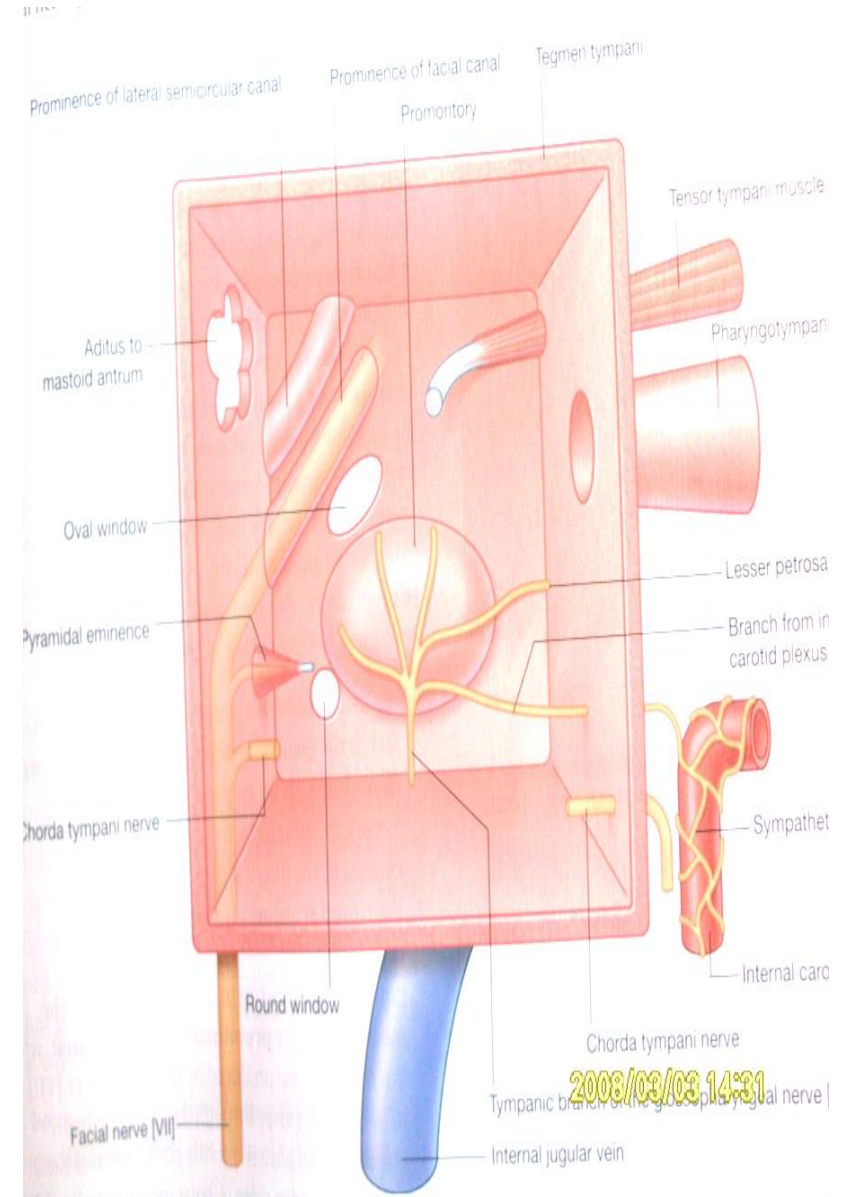
- **Lower part** –post wall of bony carotid canal- contain int carotid artery and plexus of sympathetic nerve





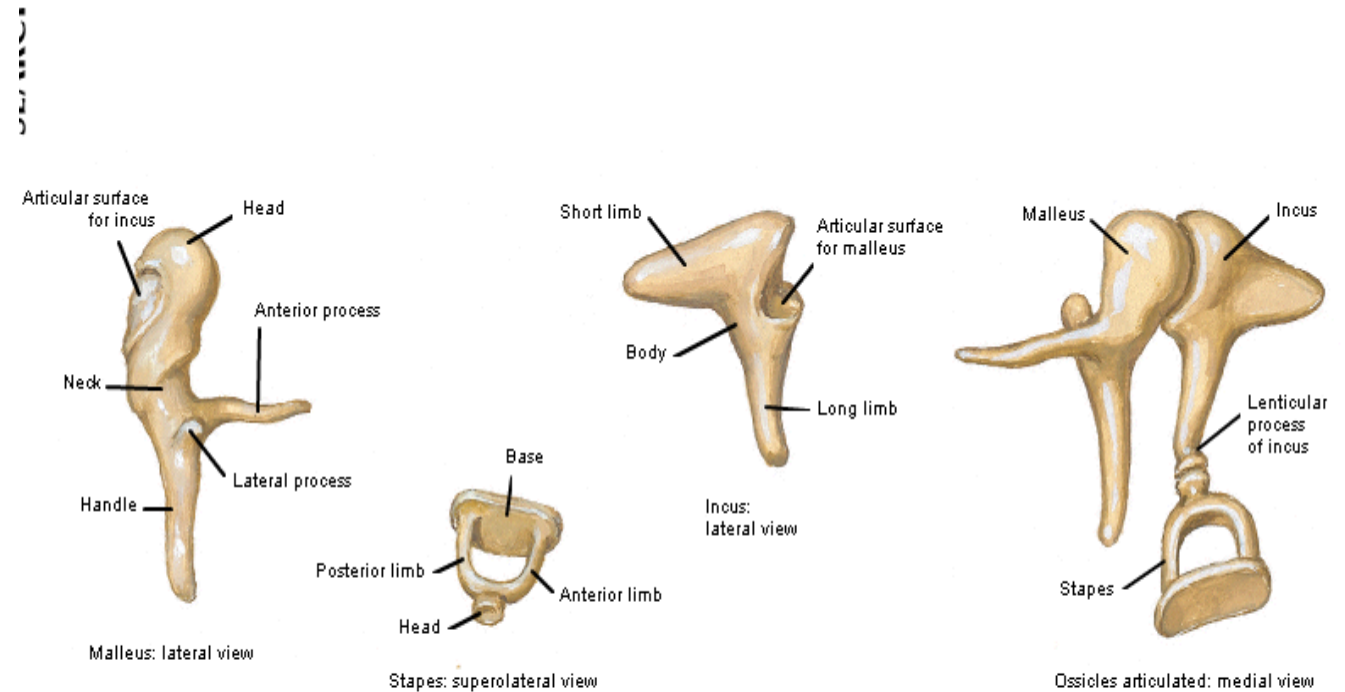
# Posterior wall/ mastoid wall

- Wider above , narrow below
- i. The aditus to the mastoid antrum is a large opening in the upper part.
- ii. The facial nerve in its vertical bony canal runs down in the medial part of posterior wall.



# Contents of tympanic cavity

- Three ossicles- malleus. Incus stapes
- Two muscle- tensor tympani, stapedius





# Nerve supply of middle ear

- The tympanic plexus is formed by tympanic branch of the glossopharyngeal nerve and caroticotympanic nerves from the sympathetic plexus around internal carotid artery.

- Tympanic membrane
- Epithelial and simple cuboidal lining
- Covered by epidermis
- It is partition between external acoustic meatus and middle ear
- It is a oval shape

- Auditory Ossicles

- 1 Malleus

- First bone of ear
- Handle of malleus is attached to internal surface of eardrum
- Head of malleus is attached with body of incus
- Primary function of malleus is transmission of sound wave or vibration from eardrum to incus

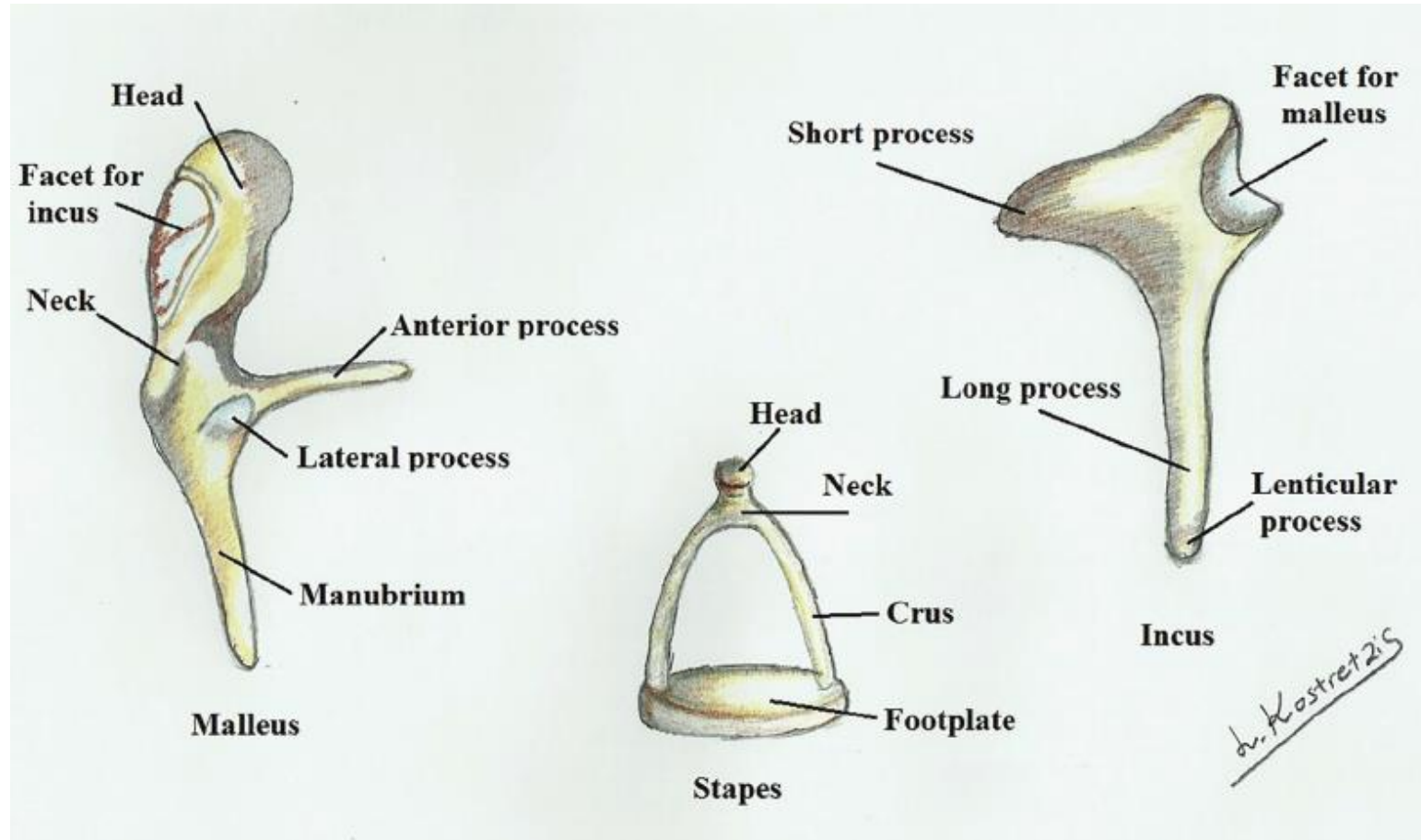
## Incus

- Second bone
- Articulate with stapes
- Transmit vibration from malleus to stapes

## Stapes

- Third and final bone of middle ear
- Smallest and lightest bone of human body
- It connect incus on the outward side and to the oval window
- The base or foot plate of stapes is fits into the oval window
- Opening into Eustachian tube

These three ossicles connect the tympanic membrane to the inner ear allowing for the transmission of sound waves



# Oval Window

- It is a membrane covered opening that lead from the middle ear to the vestibule of the inner ear
- It is a intersection between middle ear with inner ear and directly contacted by stapes

- **Auditory tube**

- It consist of bone and cartilage
- It is the route for pathogens to travel from nose to throat to air causing otitis media
- During swallowing and yawning its open to equal pressure in the middle air



# Function of Middle Ear

- transfer sound vibrations from your eardrum to your inner ear
- middle ear muscles may provide protection from loud sounds

# Internal ear

- **Components of the Internal Ear**

The internal ear consists of two components, *viz.*

1. Membranous labyrinth.
2. Bony labyrinth

- **MEMBRANOUS LABYRINTH**

The membranous labyrinth consists of the following four parts

1. Cochlear duct.
2. Sacculle.
3. Utricle.
4. Semicircular ducts (three)

- Consist of endolymph

- It is a collection of fluid filled tubes and chambers which contain the receptors for the senses of equilibrium and hearing

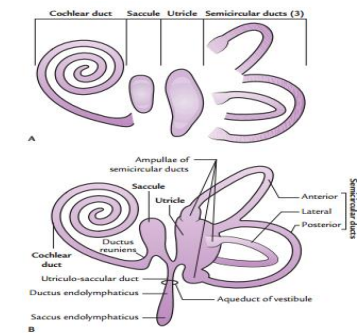
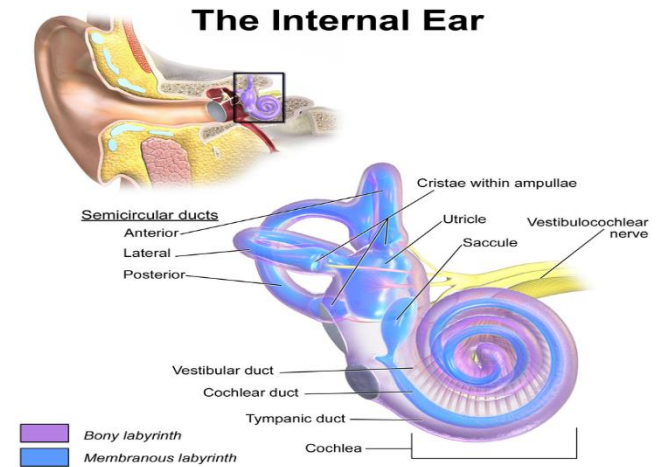


Fig. 18.13 Membranous labyrinth: A, four parts of labyrinth; B, complete labyrinth.

- Bony Labyrinth

It consist of

- cochlea
- Vestibule
- Semicircular canal
- Bony labyrinth is lined with periosteum and contains a fluid **perilymph** which is similar to CSF

# Cochlea

- Snail shaped
- Bony spiral canal
- Divided into three channel
  - Cochlear duct
  - Scala Vestibule
  - Scala Tampani
- plays a vital role in the sense of hearing

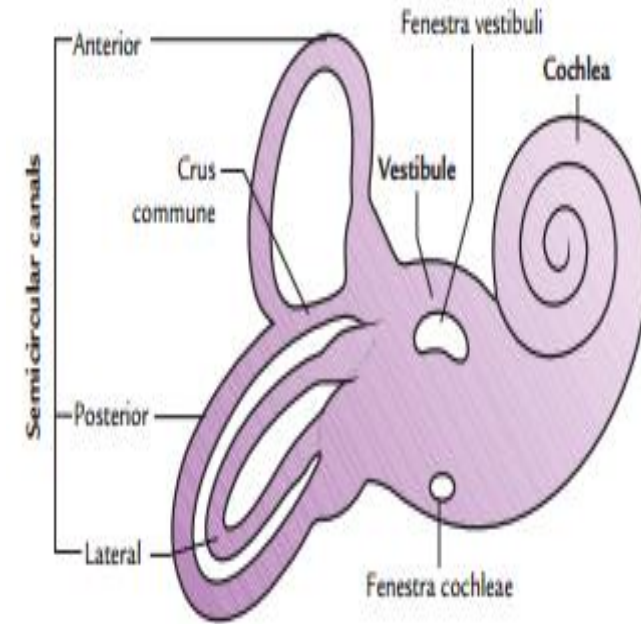


Fig. 18.16 Parts of the bony labyrinth.

# Semicircular canal

- They are named as Anterior semicircular canal  
Posterior semicircular canal  
Lateral semicircular canal
- Anterior and Posterior are vertically oriented
- Lateral is horizontally oriented
- help to keep balance

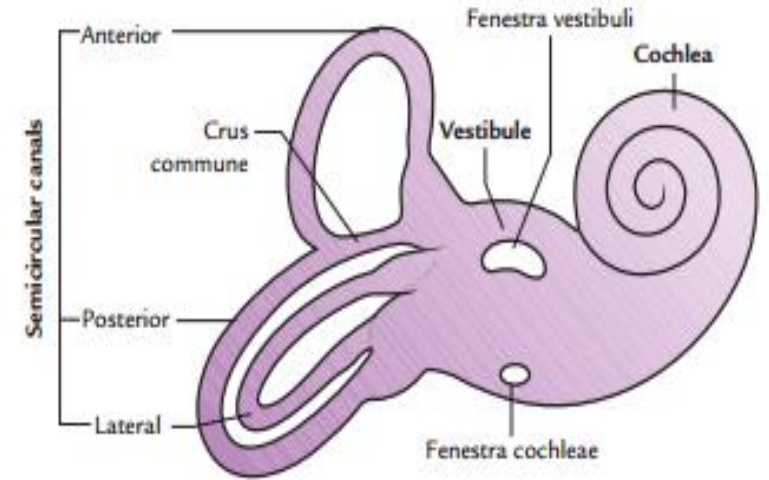


Fig. 18.16 Parts of the bony labyrinth.

# Vestibule

- It is a central part
- Lies between cochlea in front and semicircular canal behind
- It contains utricles and saccule which is a part of membranous labyrinth
- Maintain the posture and balance

# Inner Ear fluids

- **Perilymph** fills the space between bony and membranous labyrinth while **endolymph** fills the entire membranous labyrinth
- **Perilymph**
  - It resembles extracellular fluid and is rich in sodium ions
- **Endolymph**
  - It resembles intracellular fluid and is rich in potassium ions, Protein and glucose



# Function of Inner Ear

- Hearing
- Balance

THANK YOU