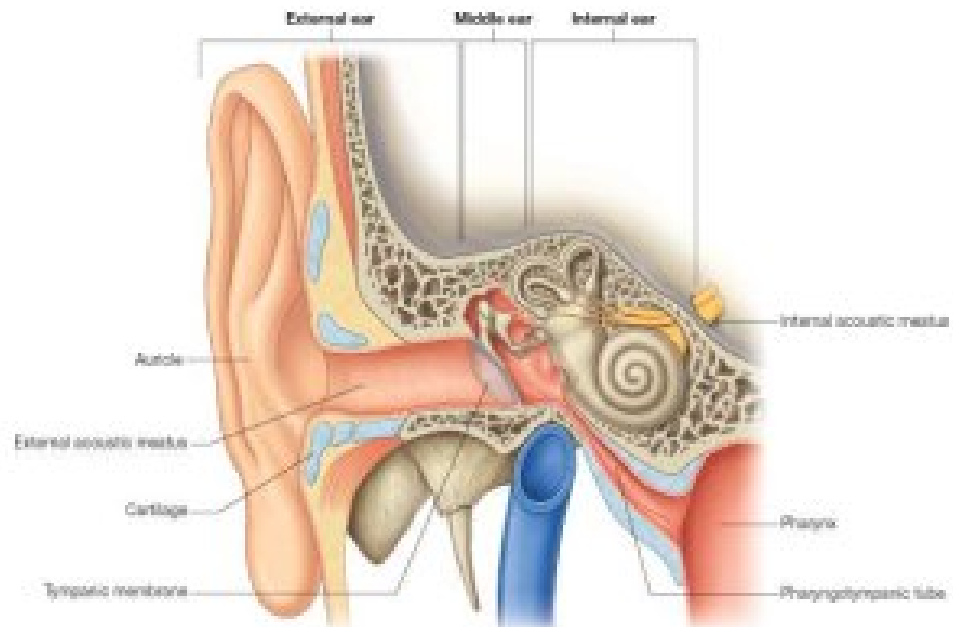
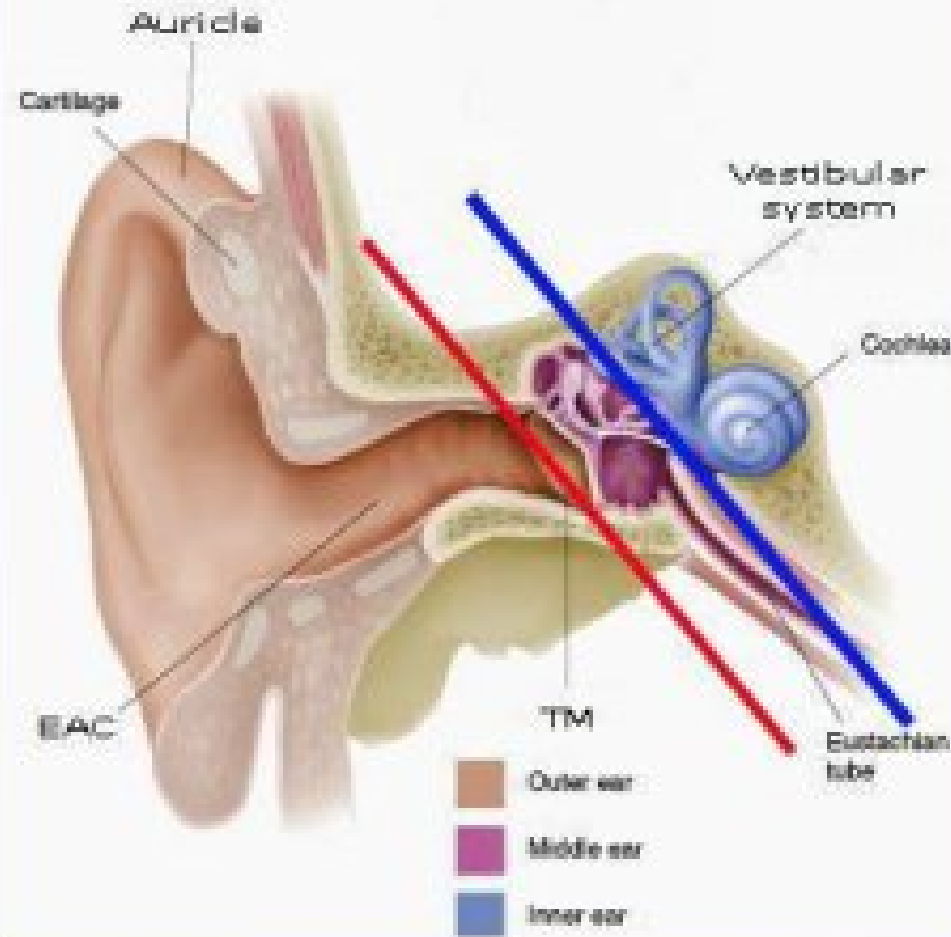


Anatomy of Ear

- External ear
- Middle ear
- Internal ear



Parts of the Ear



Inner Ear

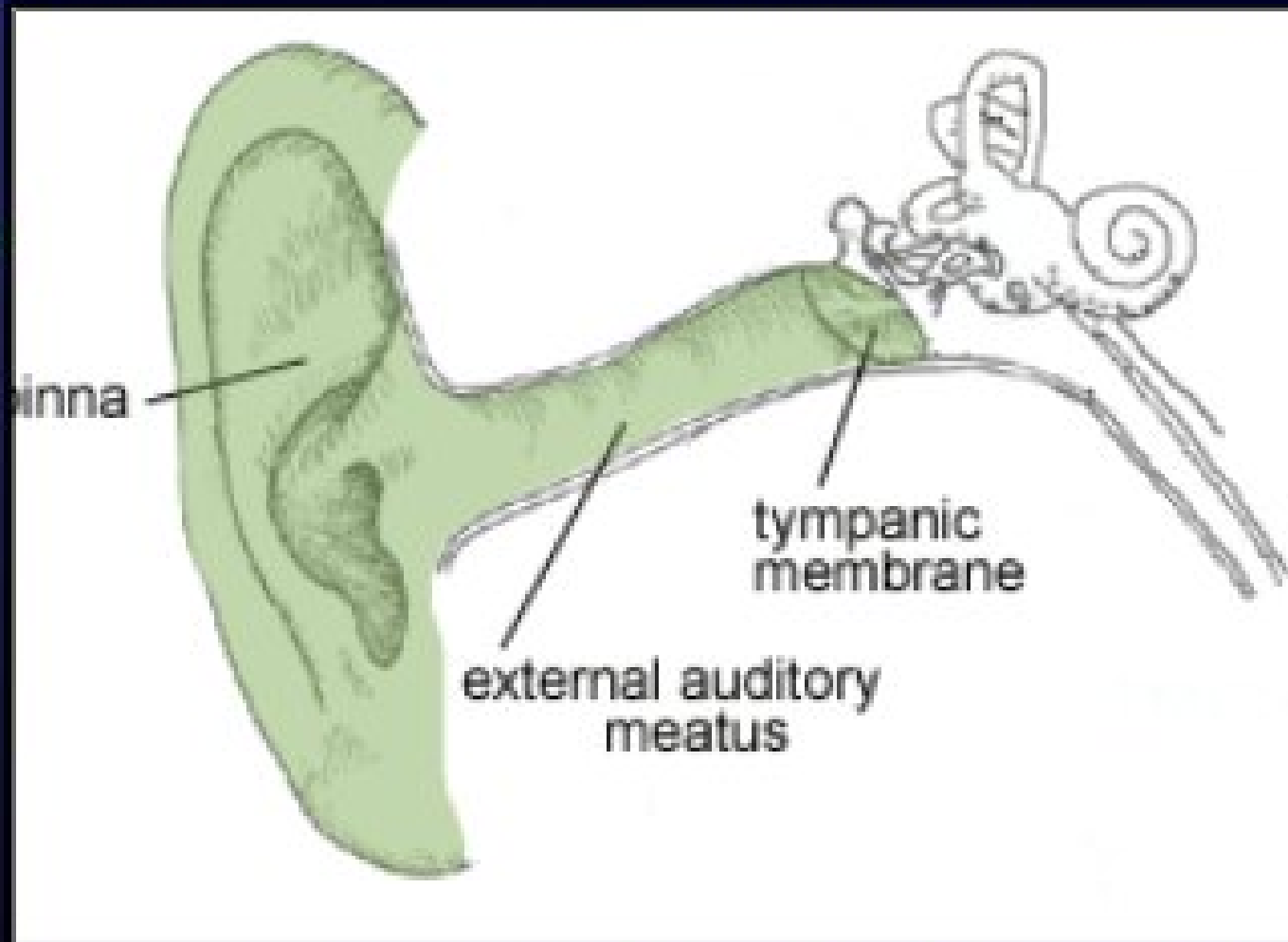
Middle Ear Cleft

External Ear

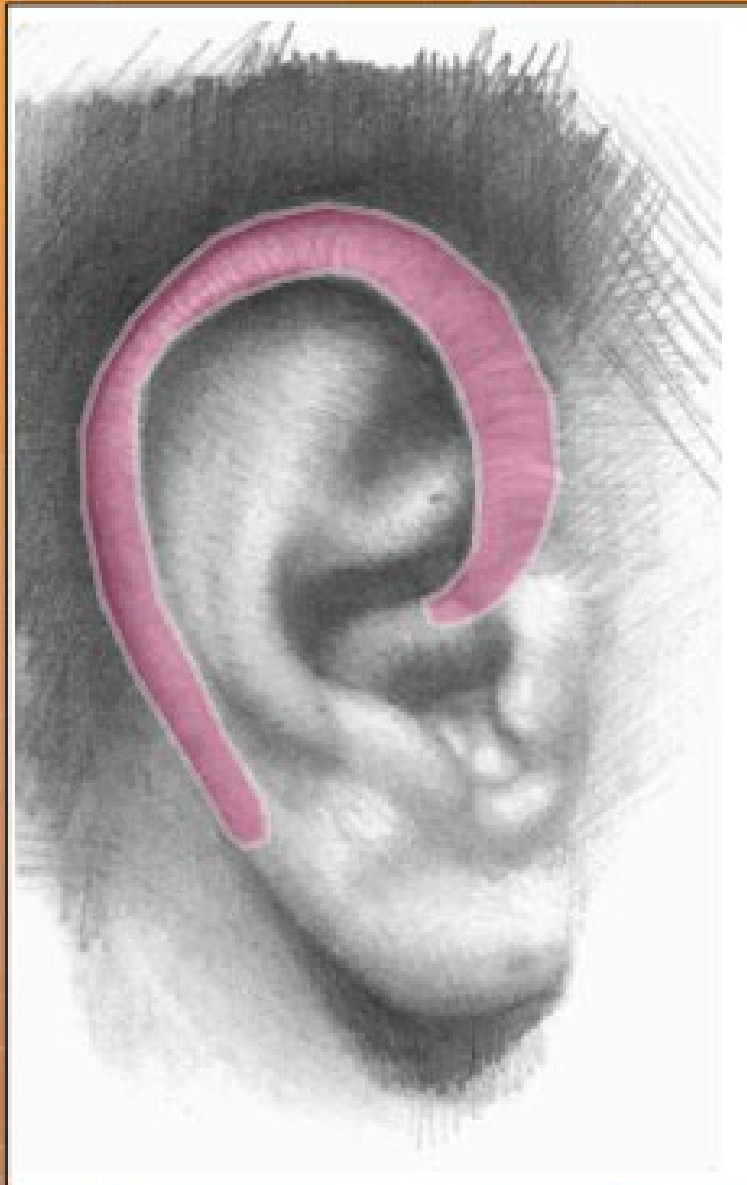
External Ear

ANATOMY

Auricle
(Pinna)



External auditory canal



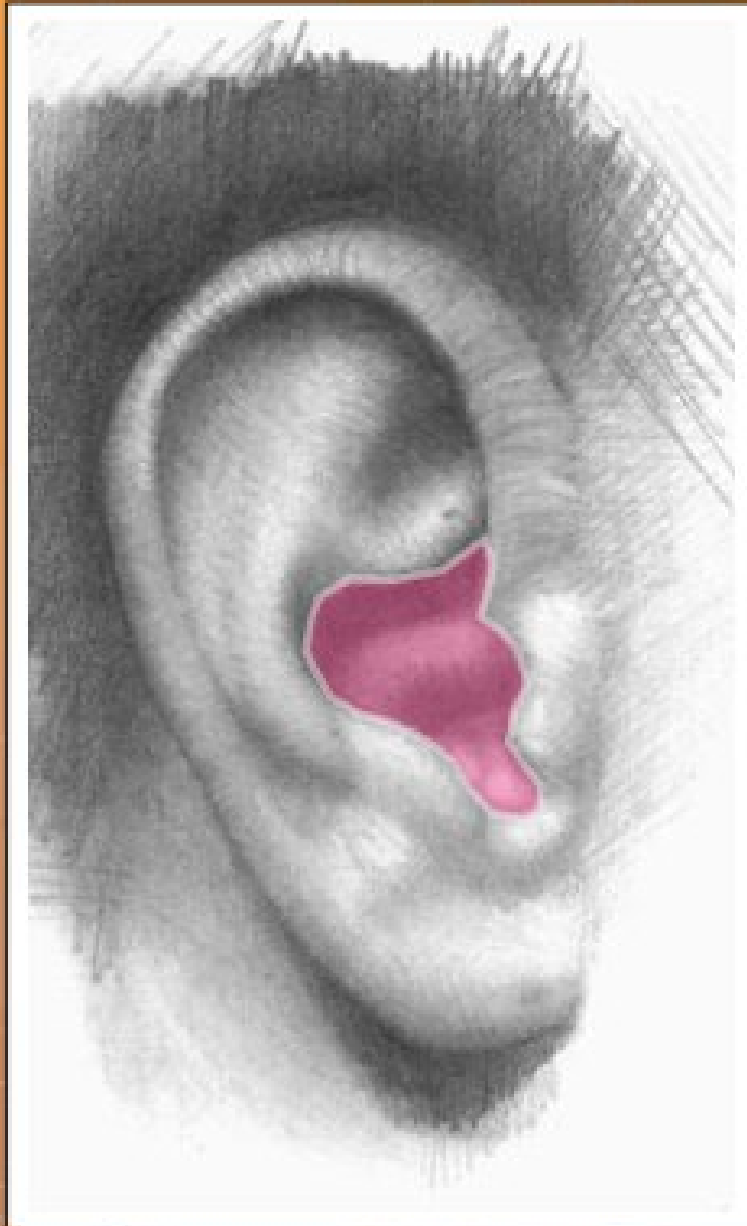
HELIX

The prominent rim of the auricle is called the **helix**



Anti Helix

Another curved prominence parallel with and in front of the helix is called the **antihelix**



Concha

the antihelix describes a curve around a deep, capacious cavity

concha

the upper part

cymba conchae,

the lower part

cavum conchae



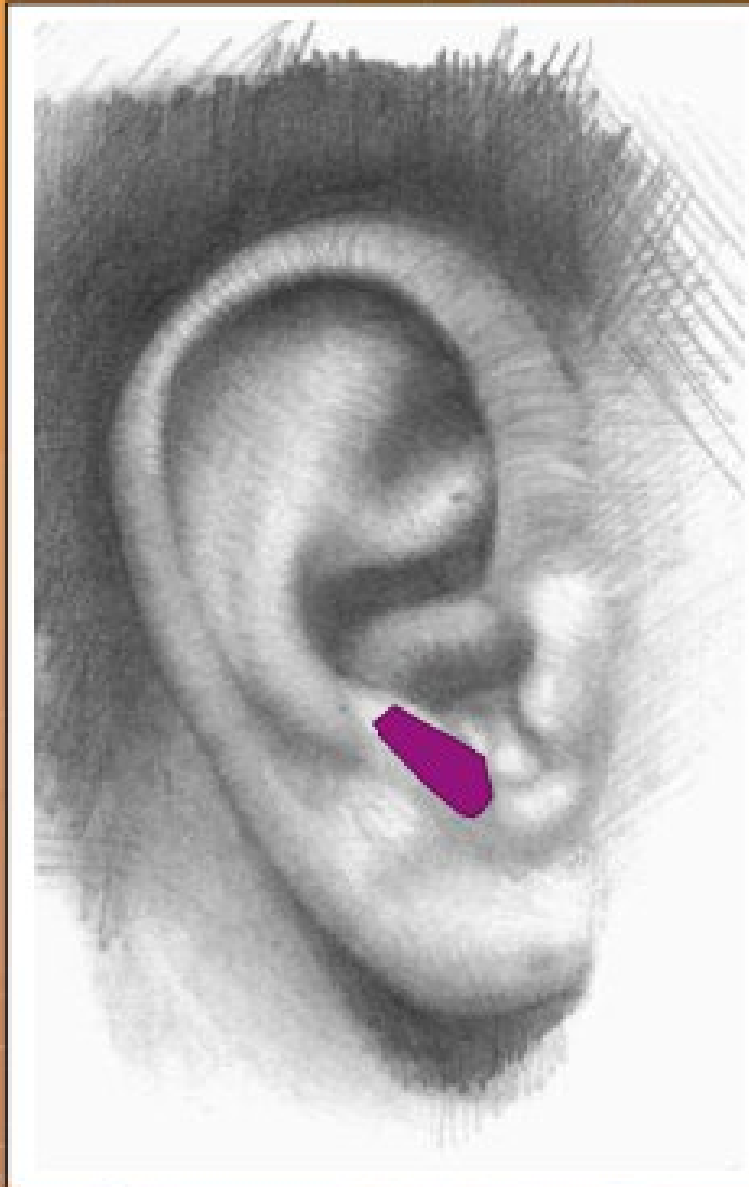
Tragus

small pointed eminence

In front of the concha, projecting
backward over the meatus



Ear lobule



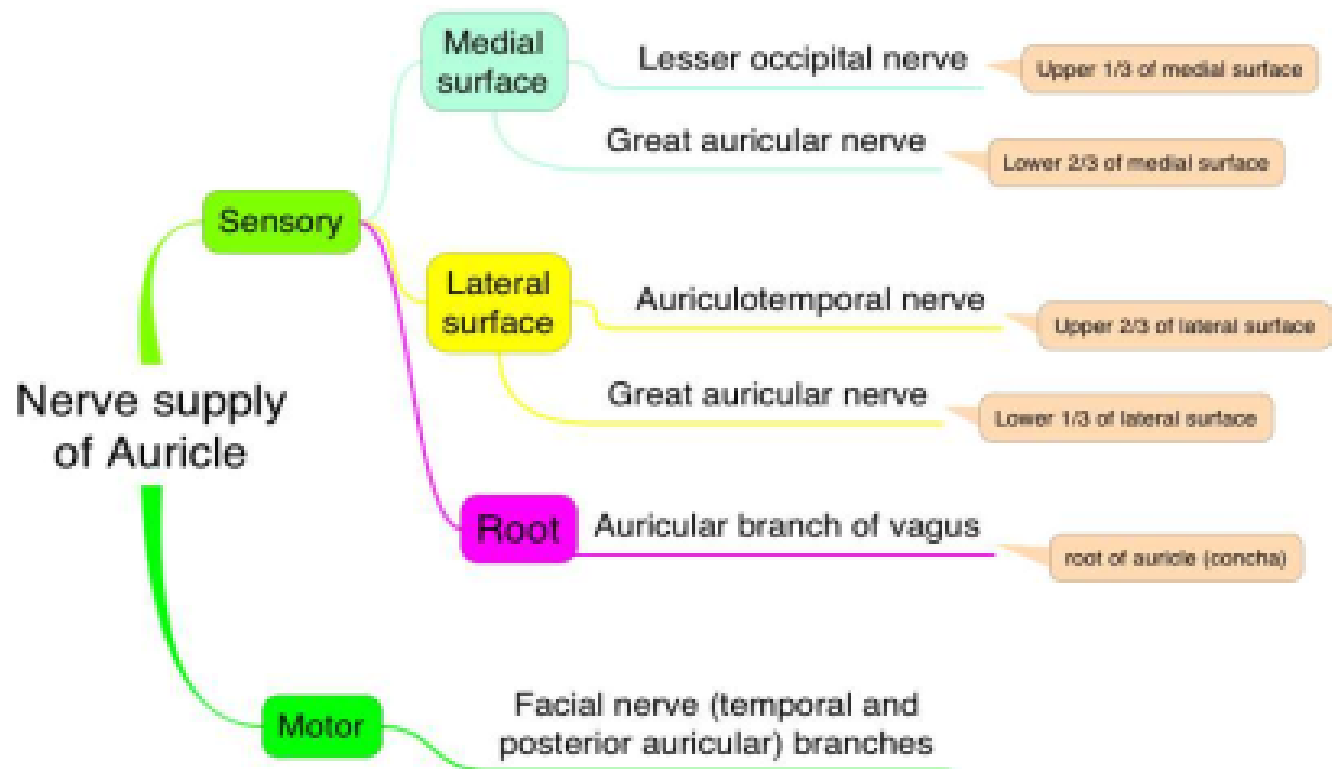
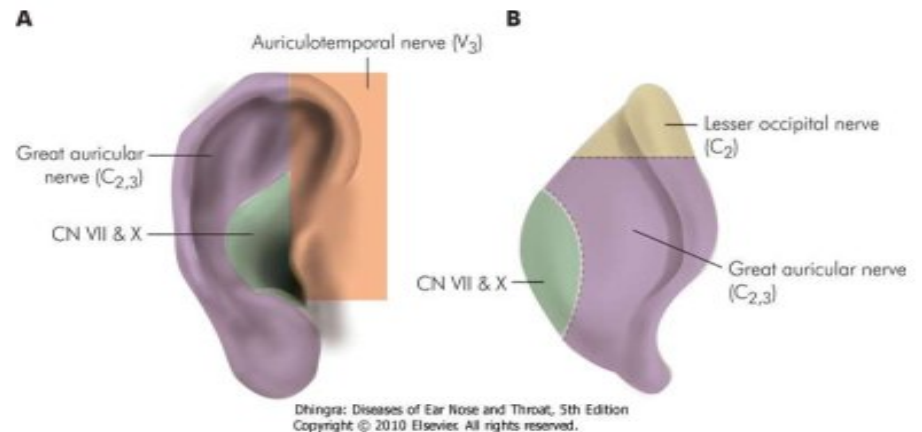
Anti tragus

6

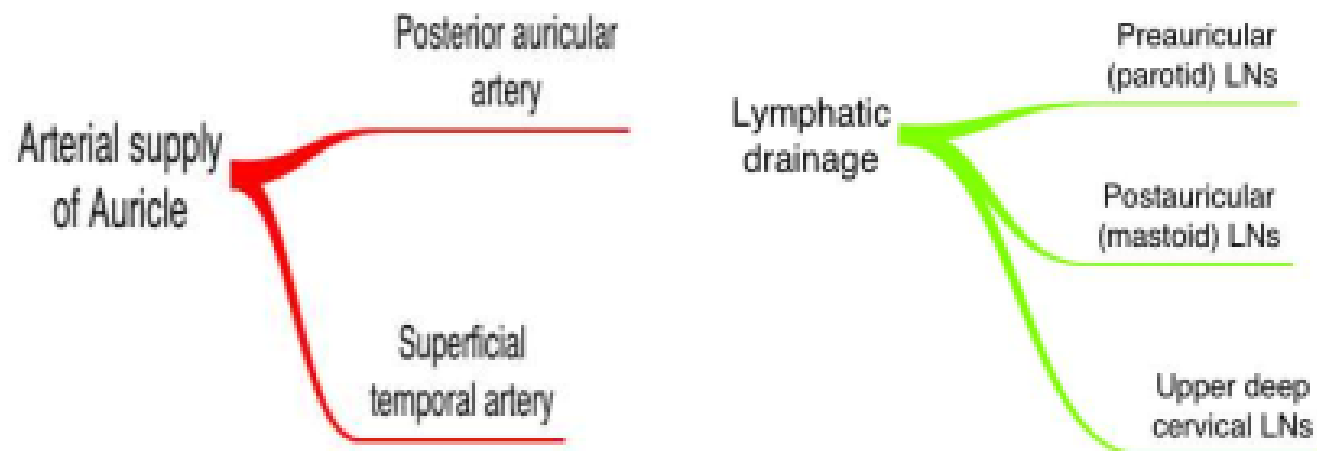
Pinna

- Skin :- thin, closely adherent to perichondrium on lateral surface covered with fine hairs which has sebaceous glands (most numerous in the concha and scaphoid fossa)
- Cartilage :- Yellow elastic fibrocartilage absent at lobule and deficient between crus of helix and tragus(**incisura terminalis**)connected to temporal bone by ligaments, 3 extrinsic & 6 intrinsic muscles.

Nerve supply

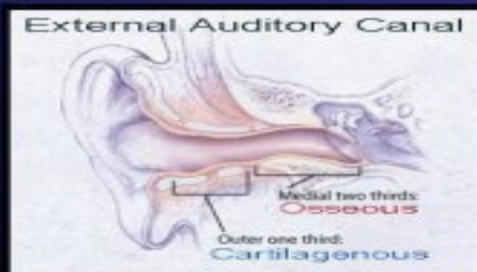
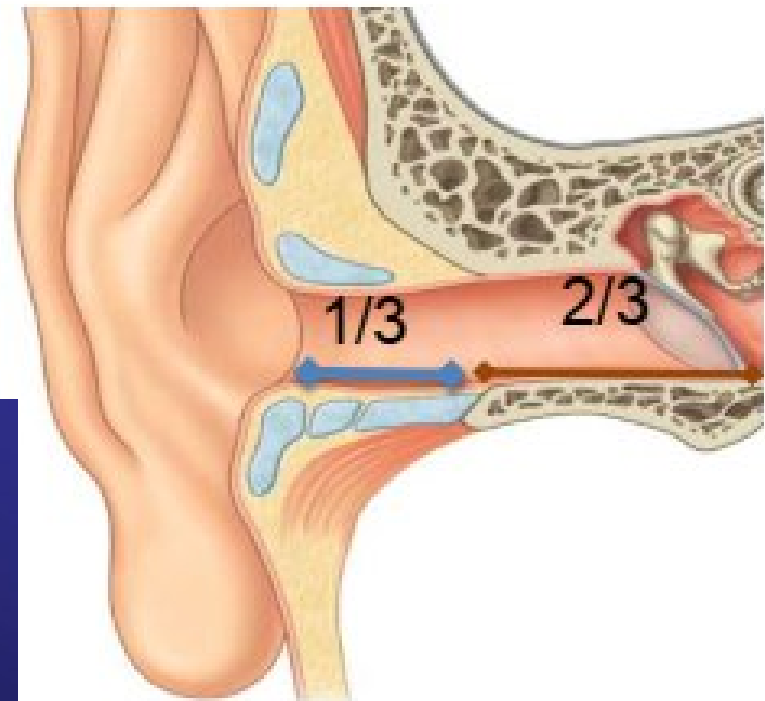


Blood & lymphatic supply of pinna



External auditory canal

- Extends from concha to tympanic membrane
- Bony cartilaginous canal



Outer 1/3: Hair follicles = furunculosis
Inner 2/3: No hair follicles

Cartilaginous part

- 8 mm in adults. Continuous with auricular cartilage.
- Deficient superiorly space is occ. by int. ligament
- Two deficiencies (**fissures of Santorini**) :- infections from parotid and superficial mastoid can enter the canal and vice-versa.
- Skin :- thick, hair follicles , sebaceous and ceruminous glands.

Nerve supply of EAC

- The auriculotemporal nerve (from the **mandibular** branch of the trigeminal nerve) provides sensory information from the anterior wall and roof
- The posterior wall and floor sensibility is carried in the nerve fibres of the auricular **branch of vagus** (Arnold nerve)
- The **tympanic plexus** offers some contributions

Mucosa of ME, ET & Mastoid air cells
Tymp. plexus (9th CN)

Post. canal wall
10th CN

Lat. surface of TM
5 & 10 CN

Ant. canal wall
5th CN

Med. surface of TM
Tymp. plexus (9th CN)

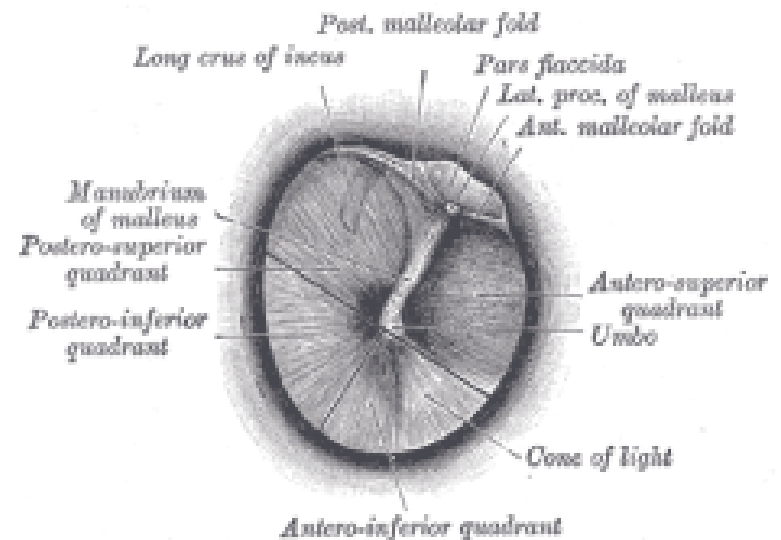


Lymphatic drainage

- Anterior wall :- **Preauricular** lymph nodes
- Posterior wall :- LN at **mastoid tip**
- Rest :- **upper deep cervical** lymph nodes

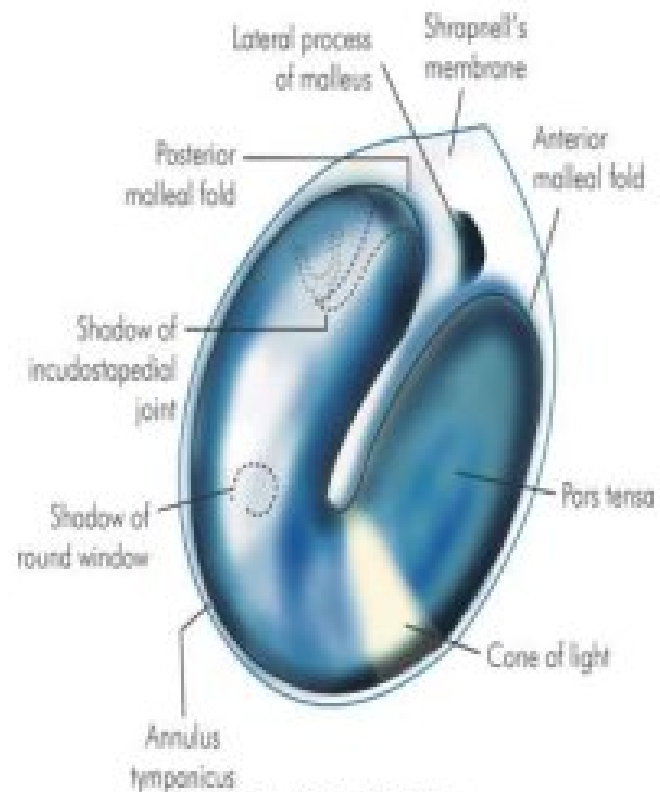
Tympanic membrane

- Cone shaped, Thin, oval disc shaped.
- **55 degree** angled.
- Longest diameter :- 9-10 mm (i.e. posterosuperior to anterosuperior)
- Shortest diameter :- 8-9 mm (perp. To longest diameter)
- Width :- 0.1 mm



Tympanic membrane

- Umbo :- maximum depression seen at the inf. tip of handle of malleus.
- Cone of light :- radiating from umbo into the anteroinferior quadrant.



Wheater's Atlas of the Human Body, 7th Edition
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Layers of the TM

- TM has 3 layers :-
- **Epithelial** (outer)- continuous with skin of EAC
- **Fibrous**/lamina propria(middle) – missing in upper part
- **Mucosal** (inner) – continuous with middle ear mucosa

Pars
Flaccida

M. Flaccida

•Skin
•MM

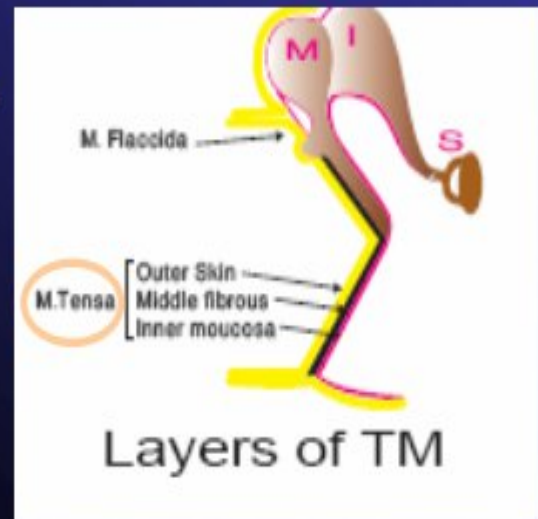
Pars
Tensa

M.Tensa

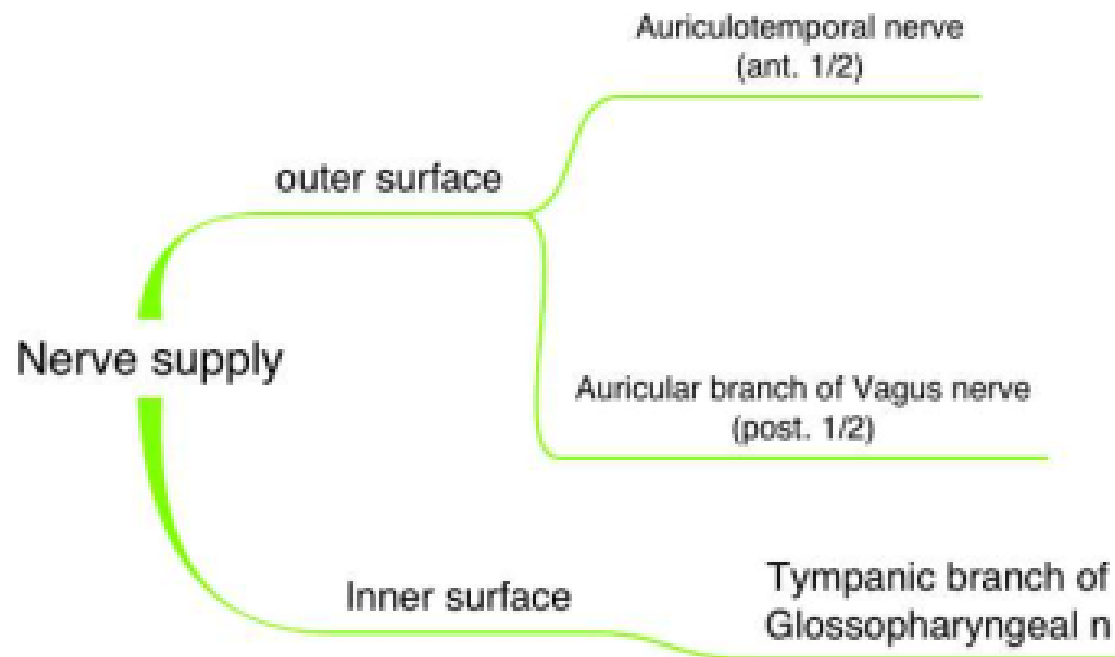
Outer Skin
Middle fibrous
Inner mucosa

•Skin
•Fibrous
•MM

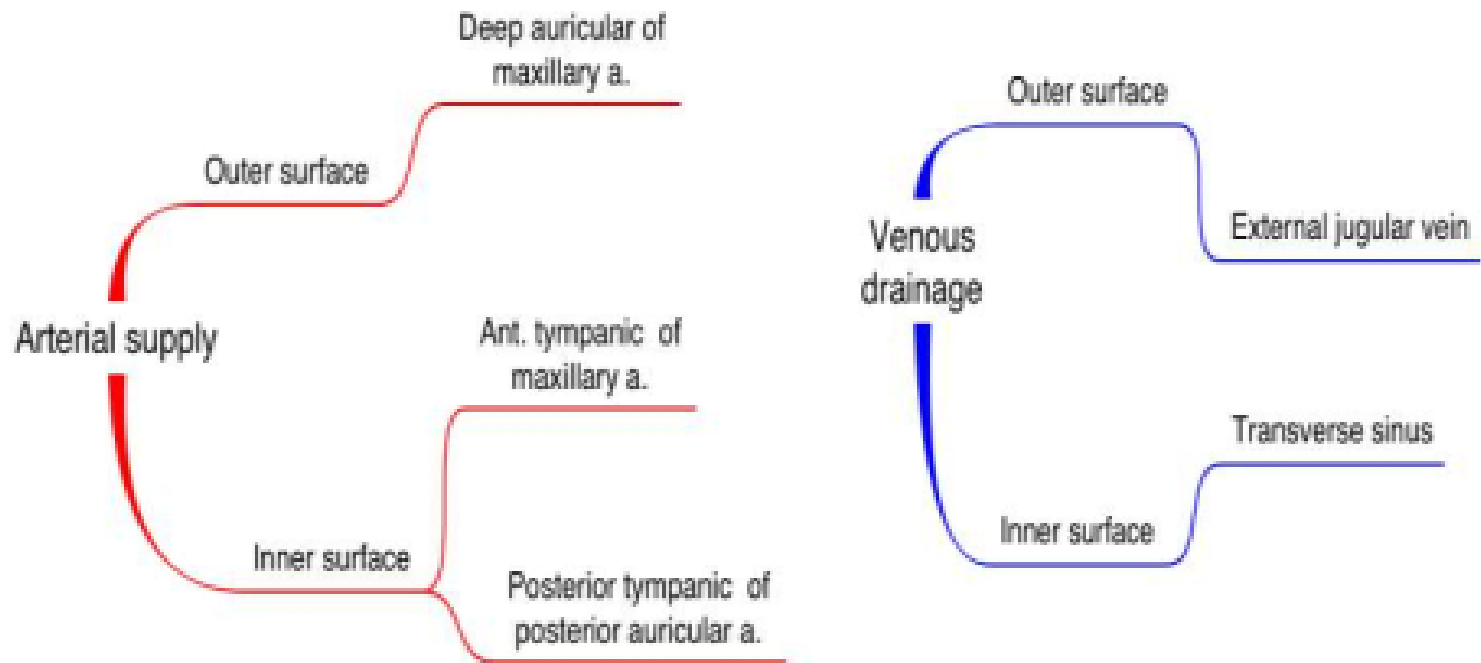
Layers of TM



Nerve supply of TM



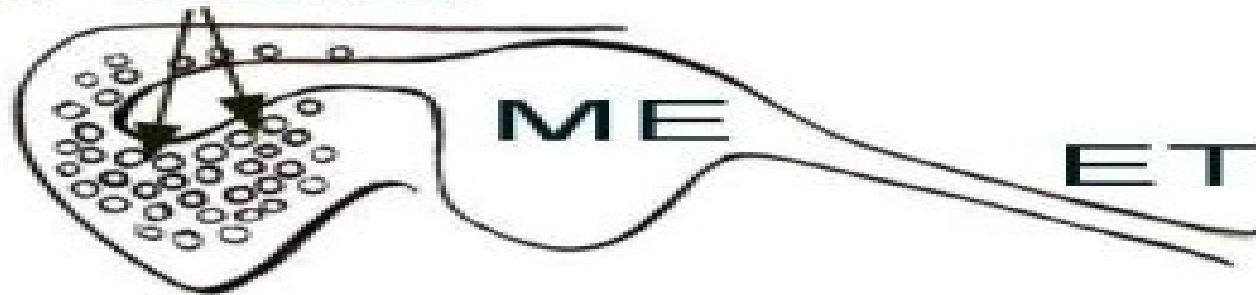
Blood supply of TM



Middle Ear Cleft

ANATOMY

Mastoid
air cells



Middle ear Cleft

Eustachian Tube

ANATOMY

From Middle ear To Nasopharynx

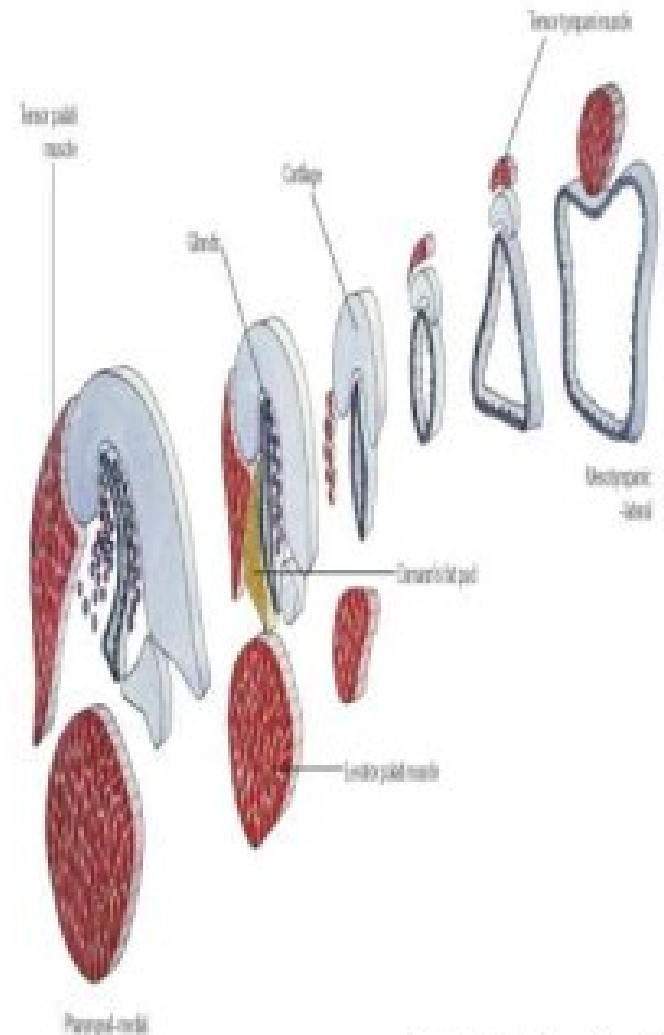


Bony opening:
•Patent

Cartilaginous opening:
•Potentially closed
•Opens on yawning & swallowing

Eustachian tube

- Passage between tym. cavity & nasopharynx
- Runs downwards, forwards & medially from middle ear at 45degree angle
- **36 mm long**, two unequal cones connected at apices
- **Lat. bony 1/3rd (12mm)**, widest-tympanic end, at ant wall of tym. cavity, narrowest-isthmus(diam. 0.5mm)
- **Med.Cart. 2/3rd(24mm)**, open medially, 1-1.25cm behind & below post. end of inf. turb. at nasoph., torus tubaris, behind it- pharyngeal recess(fossa of Rosenmuller)



Eustachian Tube

Children



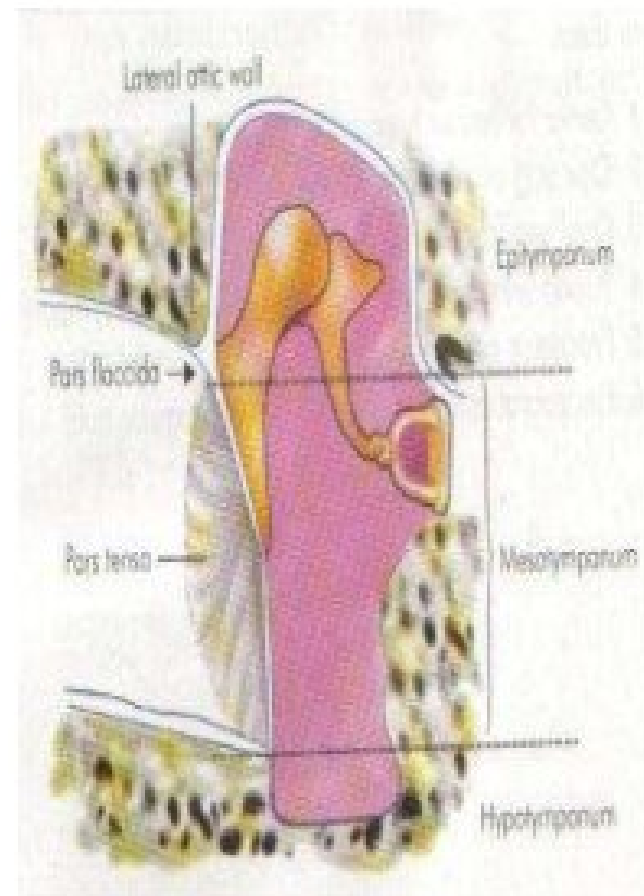
Children ET:

- Shorter
- Wider
- More horizontal

Infection is commoner in infants

Middle ear

- Tympanic cavity – six sided cavity
 1. **Epitympanum** - above malleolar folds of TM
 2. **Mesotympanum**- medial to pars tensa of TM
 3. **Hypotympanum**- below the level of TM



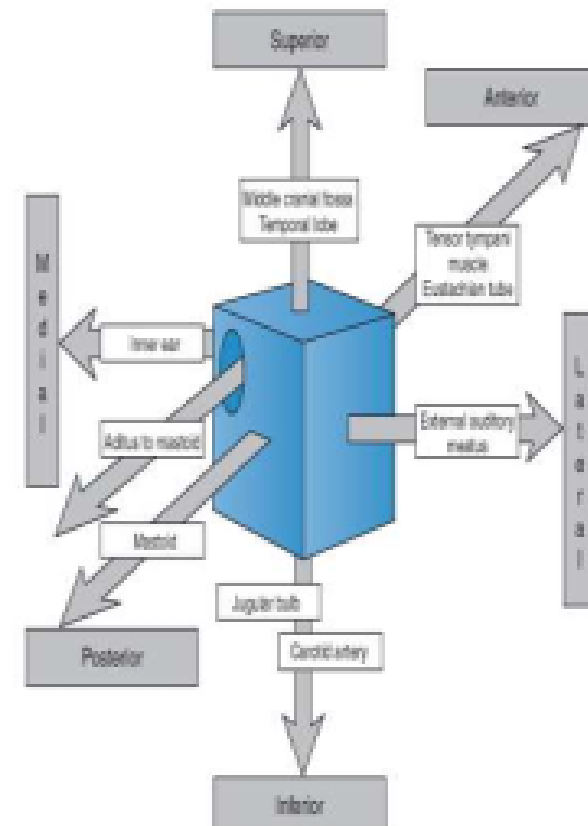
Tegmen Tympani

Middle Ear



Six sided cavity

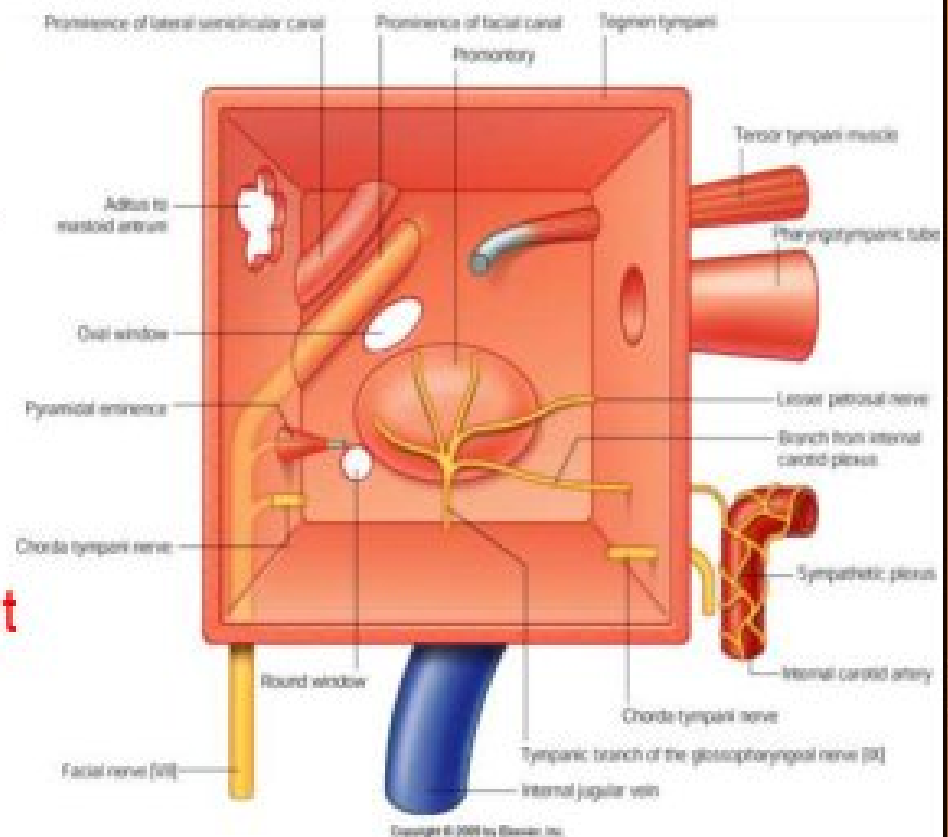
- Roof – separated from MCF – **tegmen tympani**
- Floor – separated from IJV – **thin plate of bone**
- Anterior wall
- Posterior wall
- Medial wall
- Lateral wall



©Hodder Arnold / Scott-Brown TE

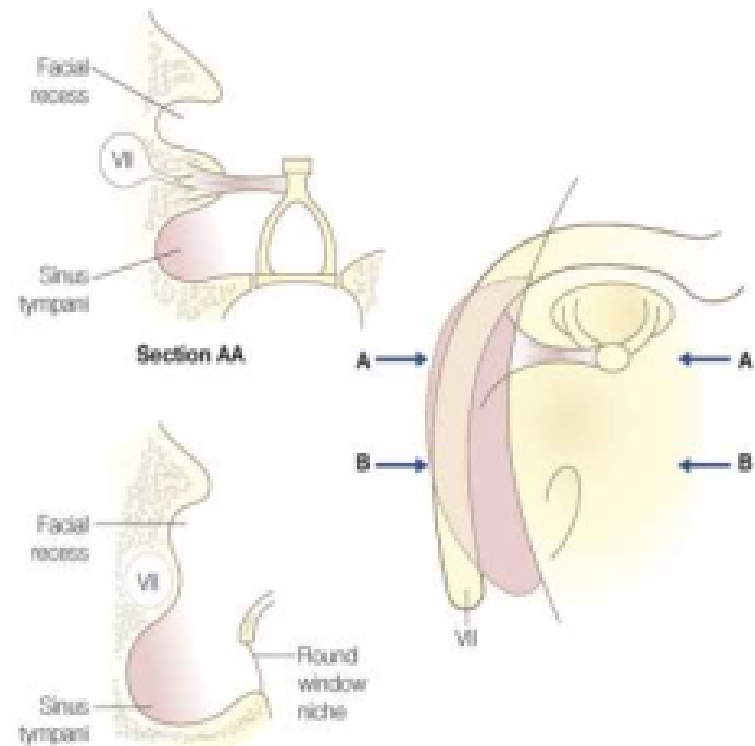
Anterior wall

- Will separate ME from ICA
- Structures passing are
 - Canal for chorda tympani .N
 - Canal for tensor tympani .M
 - Eustachian tube
 - Ant malleolar ligament
 - Ant tympanic artery



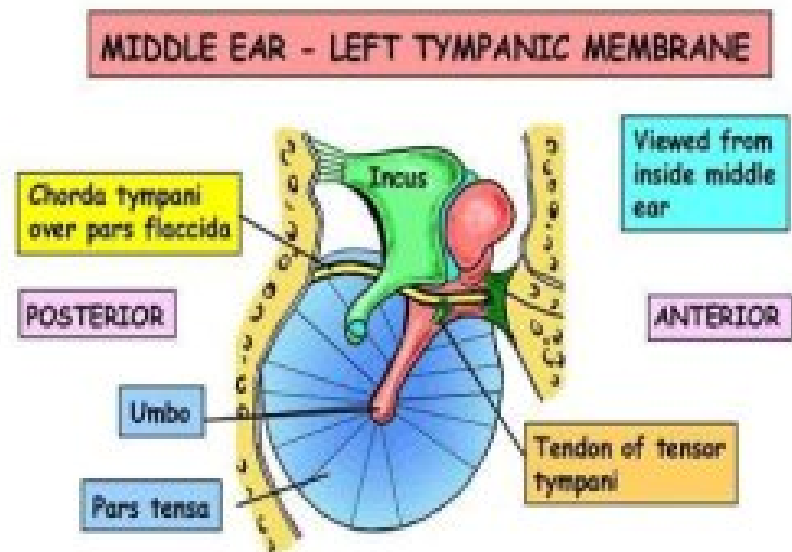
Posterior wall

- Upper part – **aditus** which leads to mastoid antrum
- Below aditus triangular projection **processus pyramidalis**
- **Facial recess** – supra pyramidal recess
- **Sinus tympani** – infra pyramidal recess



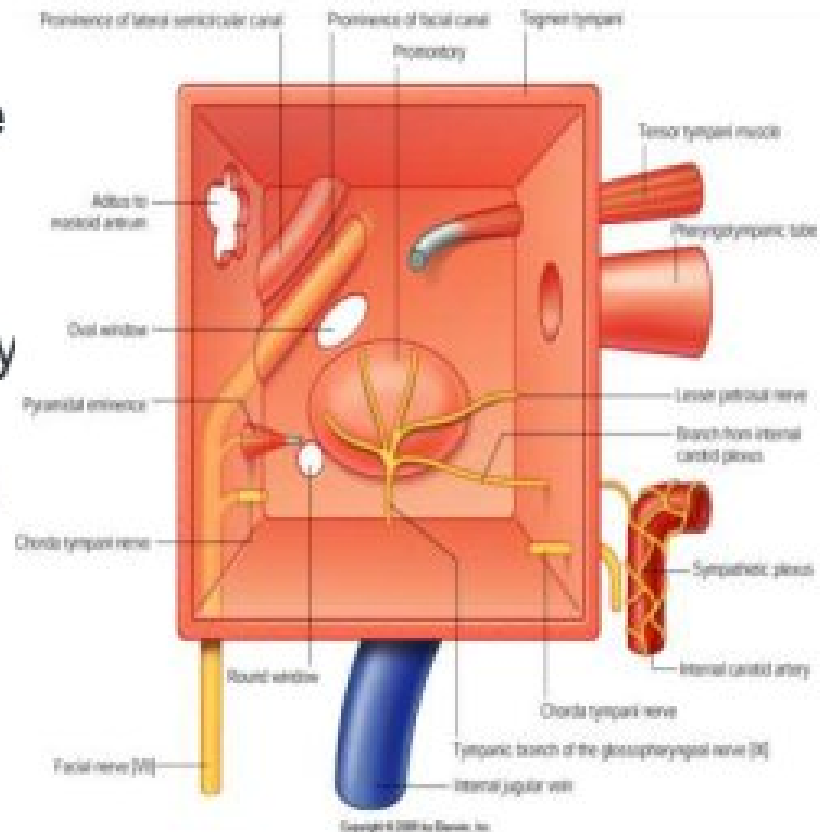
Lateral wall

- Separate external ear from middle ear
- Formed by TM and squamous part of temporal bone



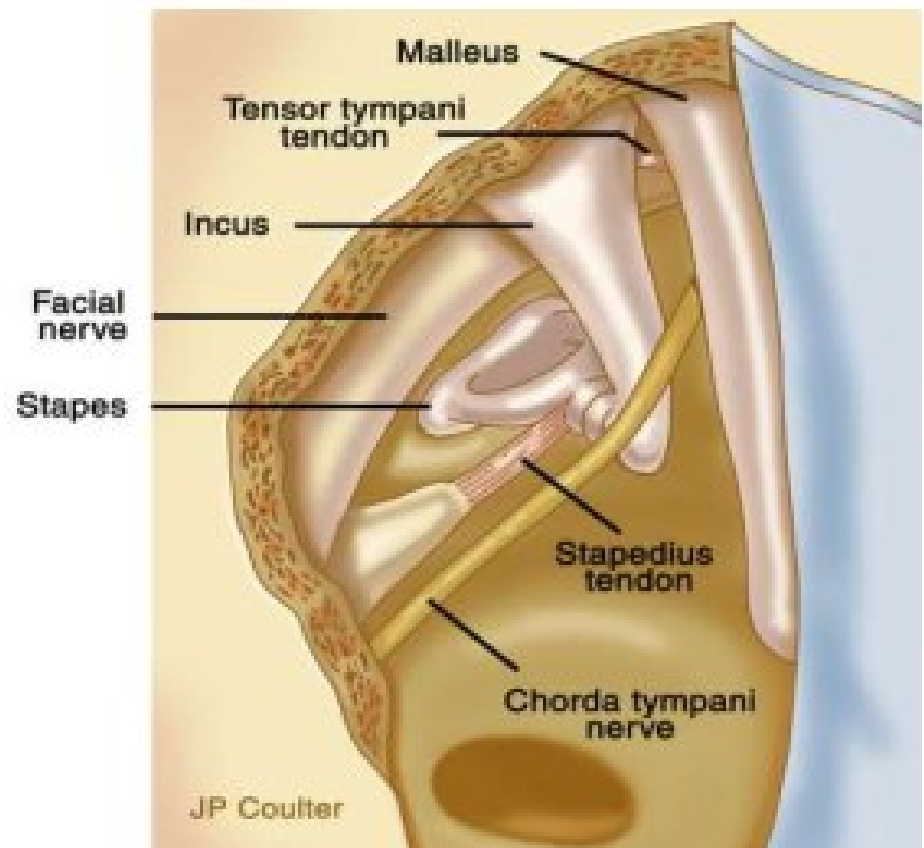
Medial wall

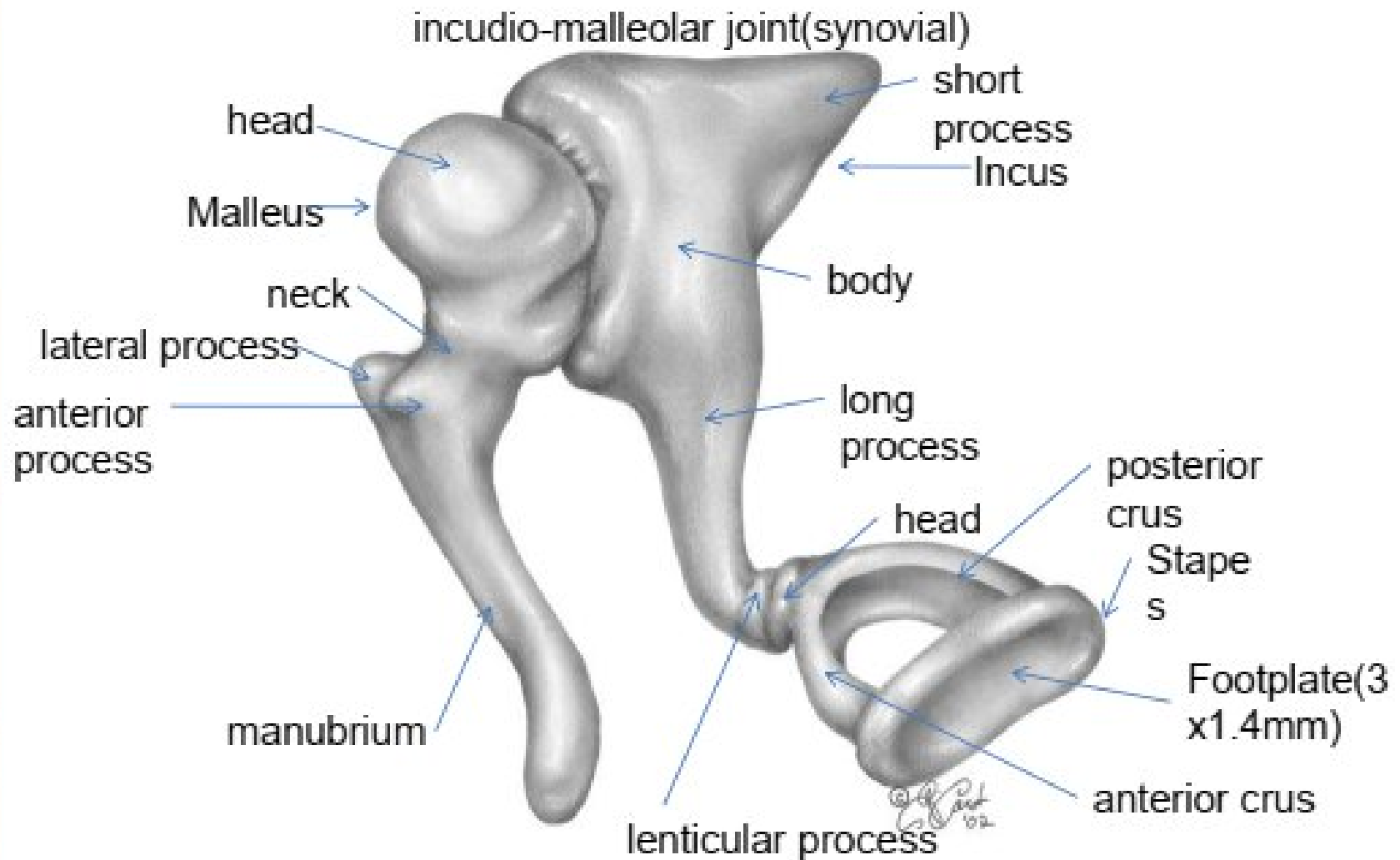
- Separate middle ear from inner ear
- Important structures are
 1. **Promontory**
 2. **Bony lat SCC**
 3. **Oval window** – closed by footplate of stapes
 4. **Round window** – closed by secondary TM
 5. **Facial nerve**



Contents of the middle ear

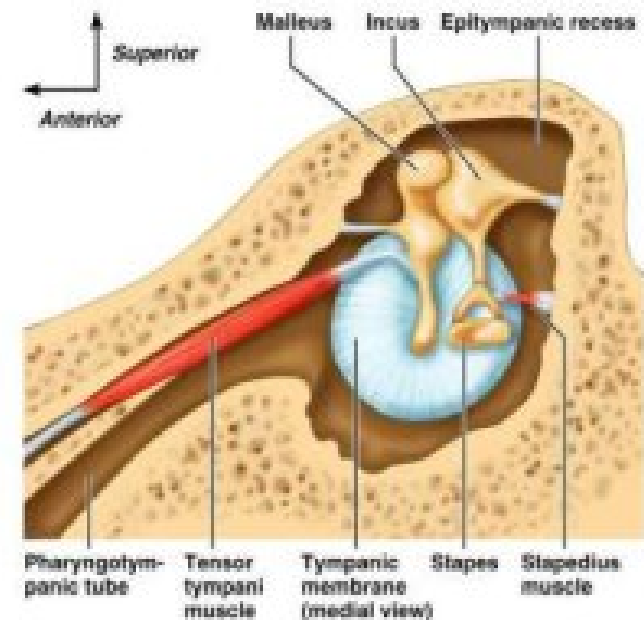
- **Ear ossicles**
 1. Malleus (hammer)
 2. Incus (anvil)
 3. Stapes (stirrup)
- **Muscles**
 1. Tensor tympani
 2. Stapedius
- **Mucosal folds**
- **Nerves**
- **vessels**





Muscles

- **Stapedius** origin- pyramid, Insertion- into posterior part of neck & upper part of posterior crus, supplied by **small br. of FN**
- **Tensor Tympani** origin- walls of bony canal above ET, cart. part of ET, greater wing of sphenoid Insertion- medial aspect of upper end of handle of malleus supplied by branch of **mandibular nerve**



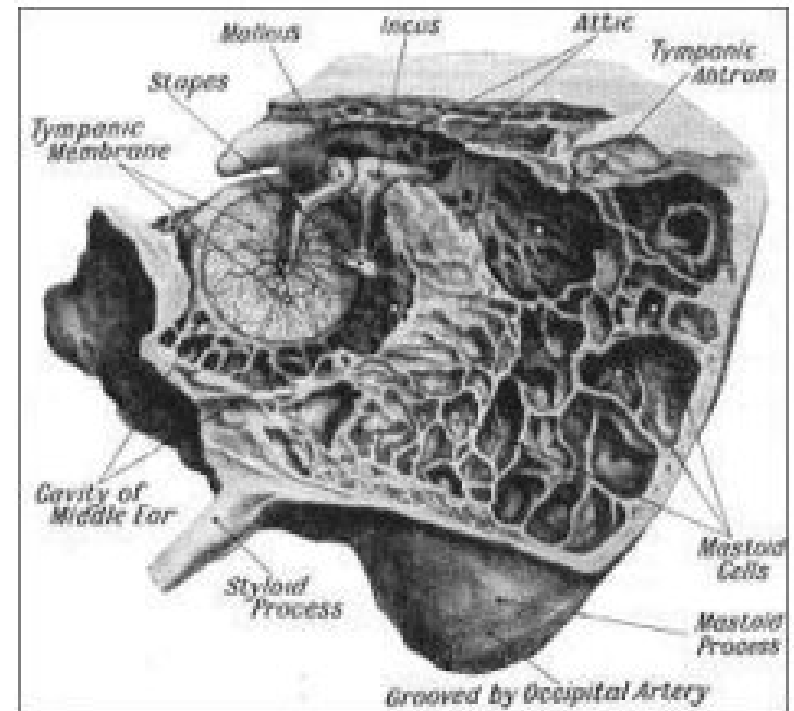
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Nerves & vessels of middle ear

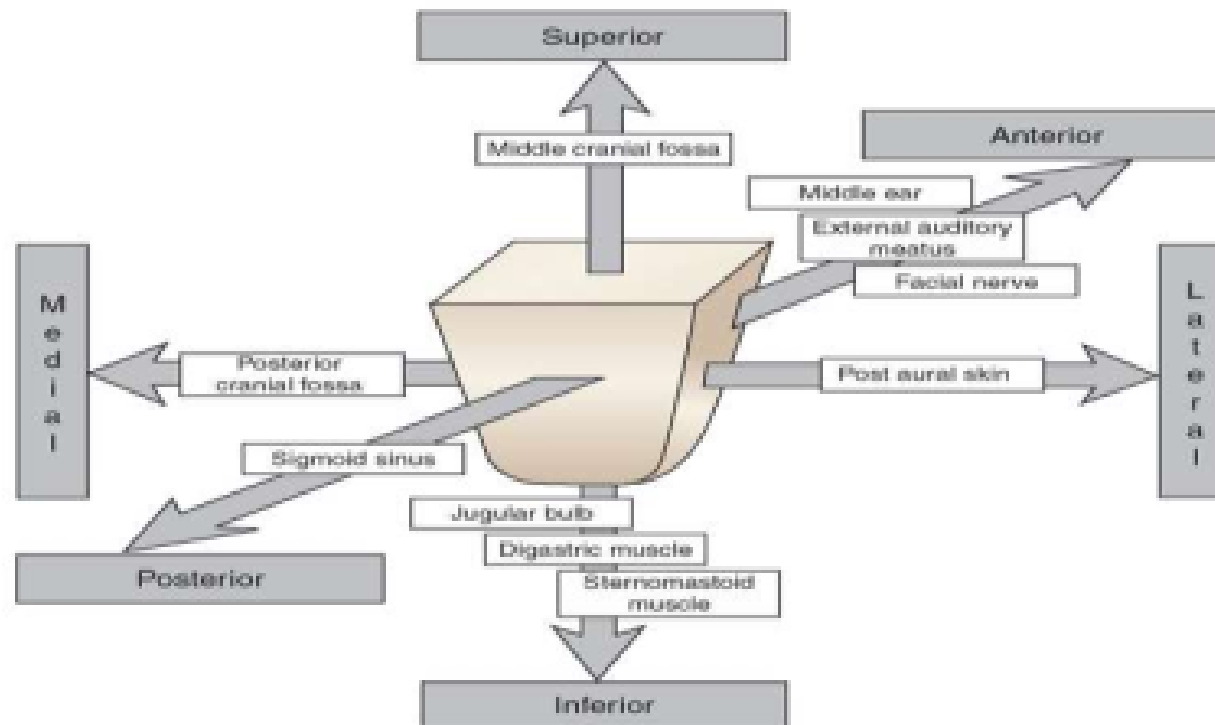
- Chorda tympani nerve
- Tympanic plexus
- Plexus of vessels of stylomastoid artery
- Carotico tympanic artery

Mastoid

- 3 important parts
 - Aditus** – connects epitympanum with mastoid
 - Antrum** – largest air cell in the mastoid bone
 - Mastoid air cells**

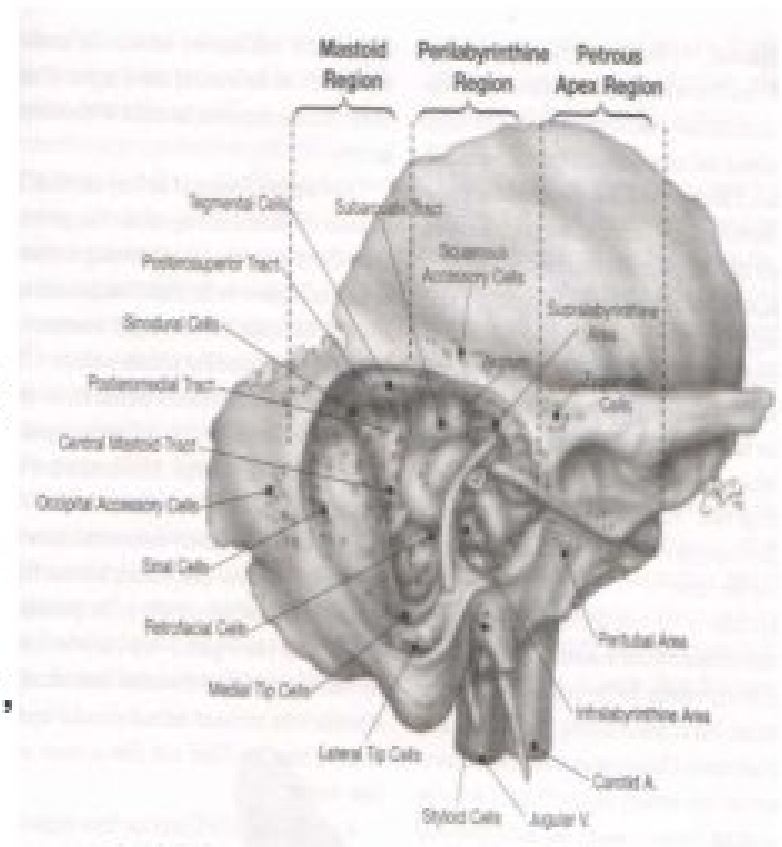


Relations of the mastoid

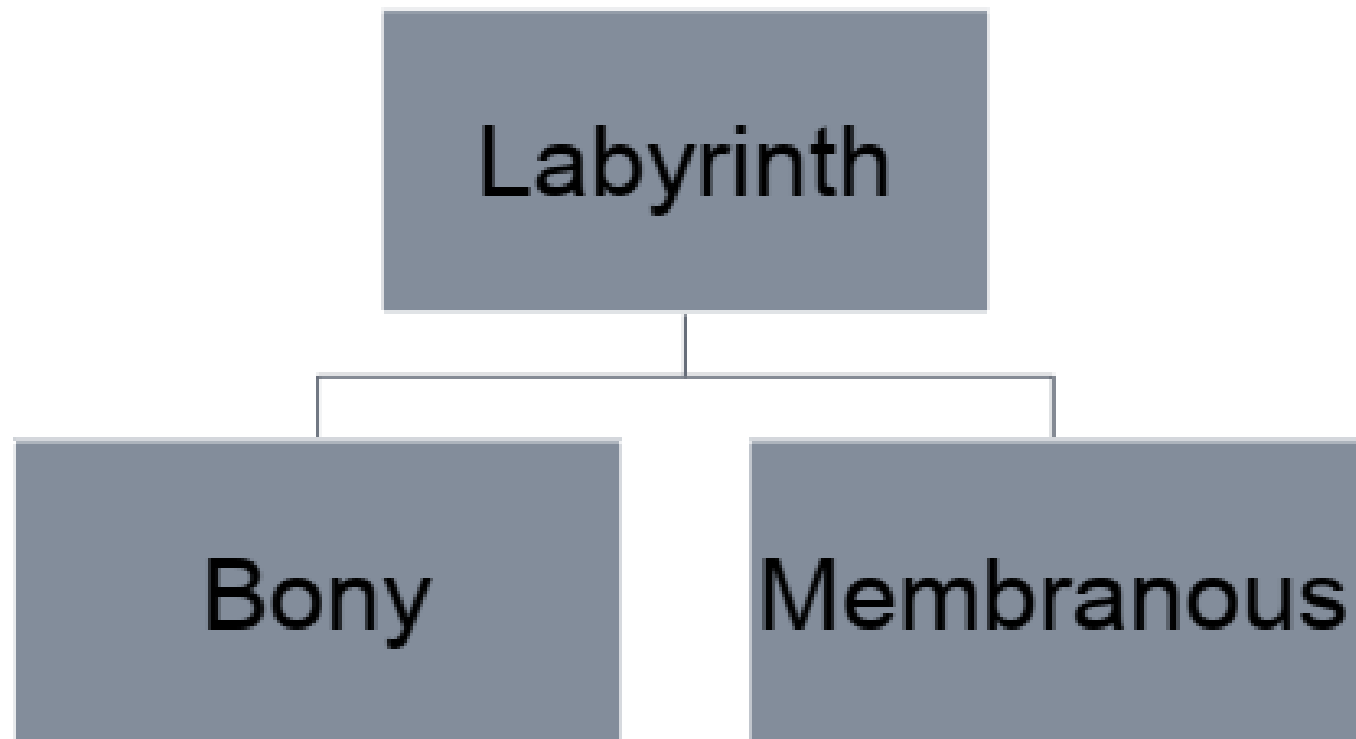


Mastoid air cells

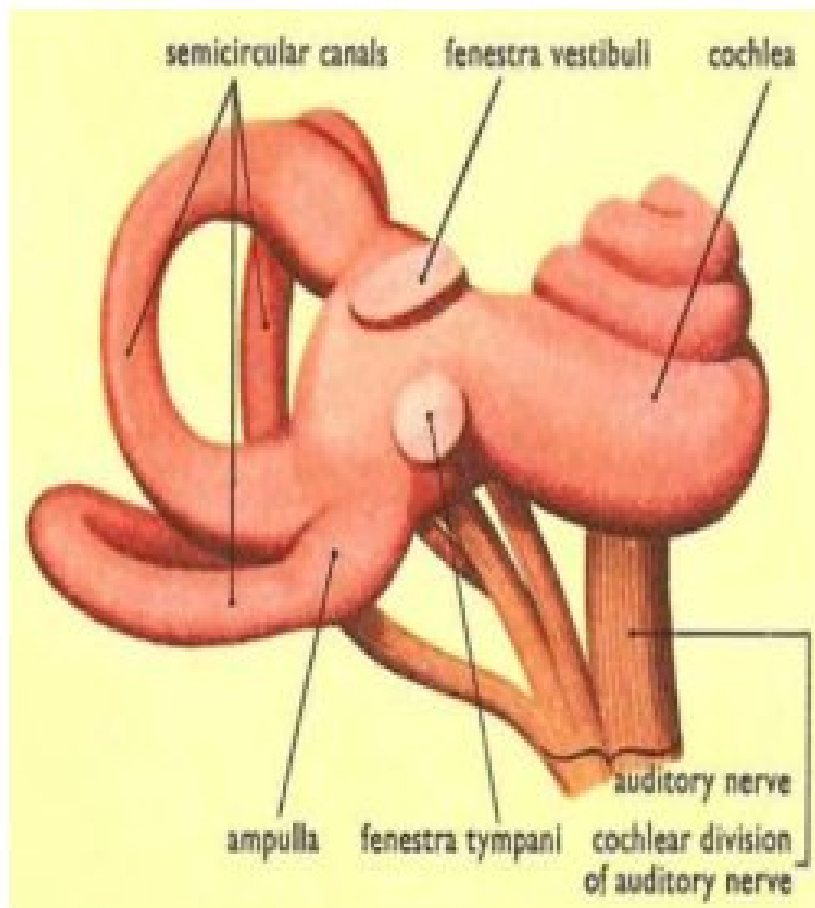
- Pneumatic(70%), sclerotic(20%), diploic(5%)
- Depends on-heredity, environment, nutrition, infection, ET function
- Five regions of pneumatization- middle ear, mastoid, perilabyrinthine, petrous apex & accessory
- Five air cell tracts- postero-superior, postero-medial, subarcuate, perilabyrinthine, peritubal



Internal ear



Bony labyrinth



BONY LABYRINTH

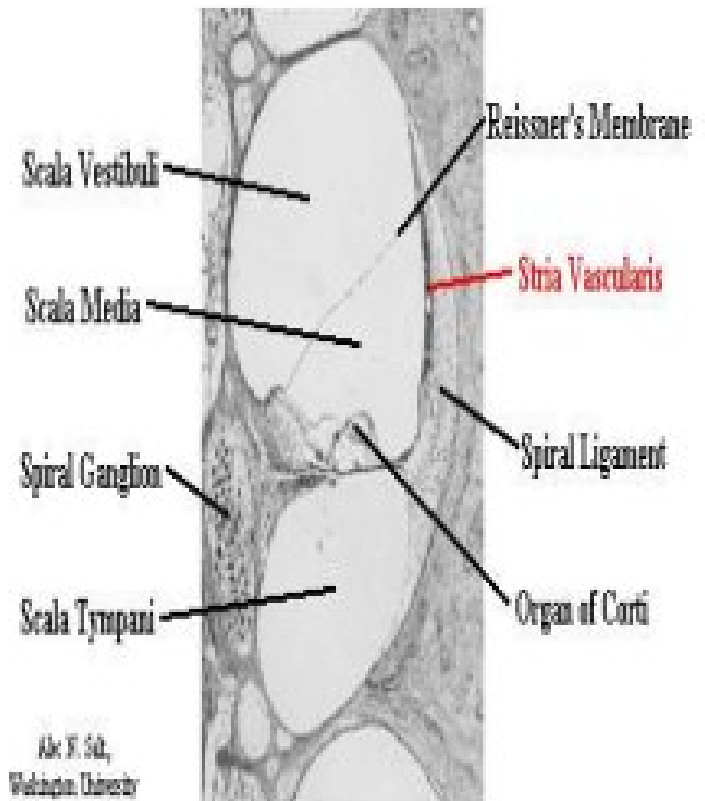
VESTIBULE

SEMICIRCULAR
CANALS

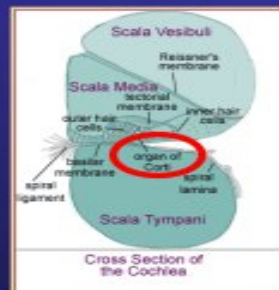
COCHLEA

Cochlea

- The cochlea is partially divided into an upper **scala vestibuli** and lower **scala tympani** by a thin bony shelf, osseous spiral lamina.
- This division is completed by the **scala media**. Its floor is formed by the **basilar membrane**. **Reissner's membrane** forms the roof of the scala media

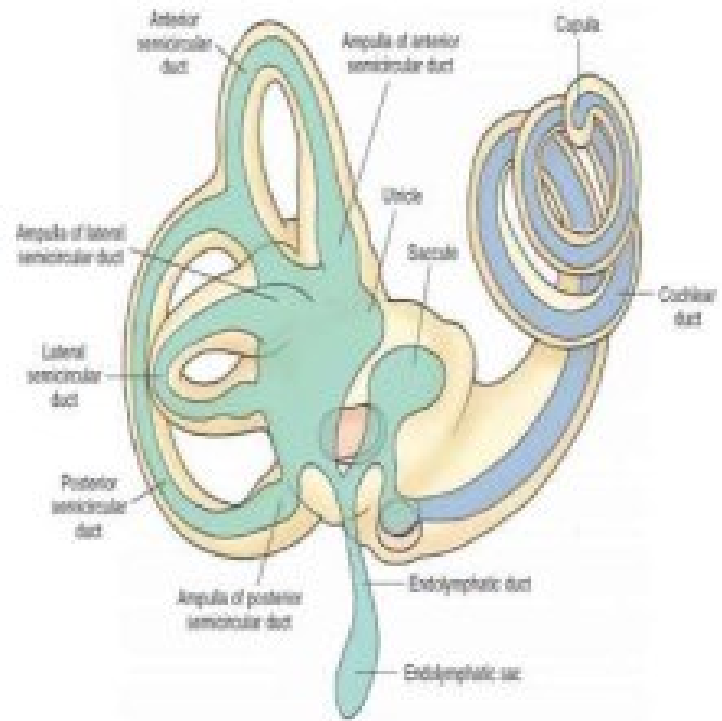


Abu H. Sidi,
Washington University



Membranous labyrinth

- Membranous vestibular labyrinth
 1. Saccule
 2. Utricle
 3. Endolymphatic duct and sac
- Membranous semi-circular canal
- Membranous cochlear labyrinth

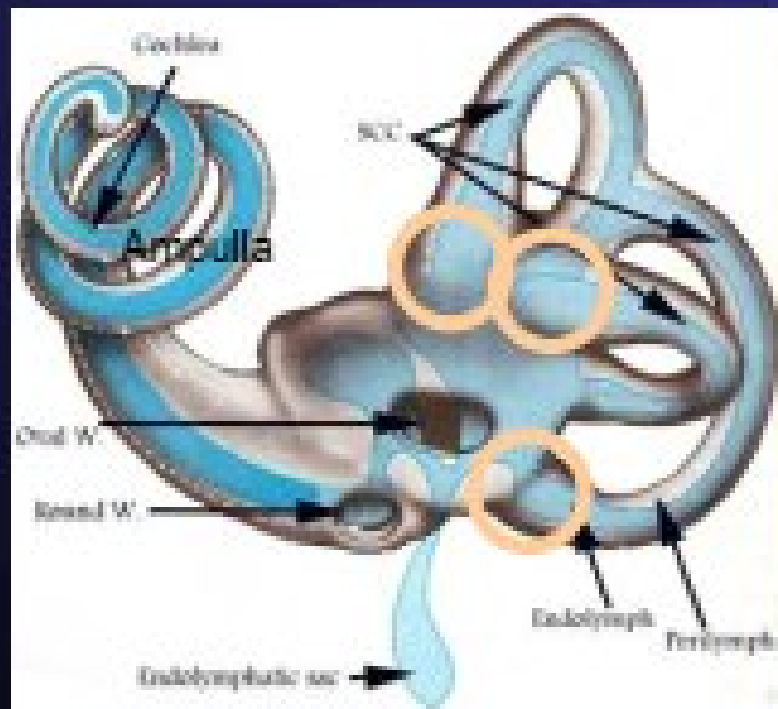


Inner Ear

Vestibular apparatus

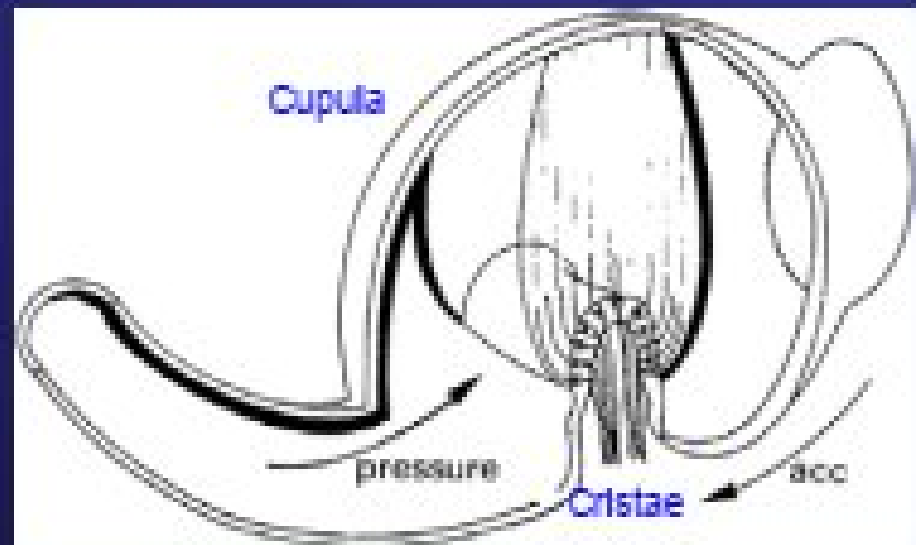
SCC (3)

Angular acceleration



Ampulla of SCC

Cristae ampullaris

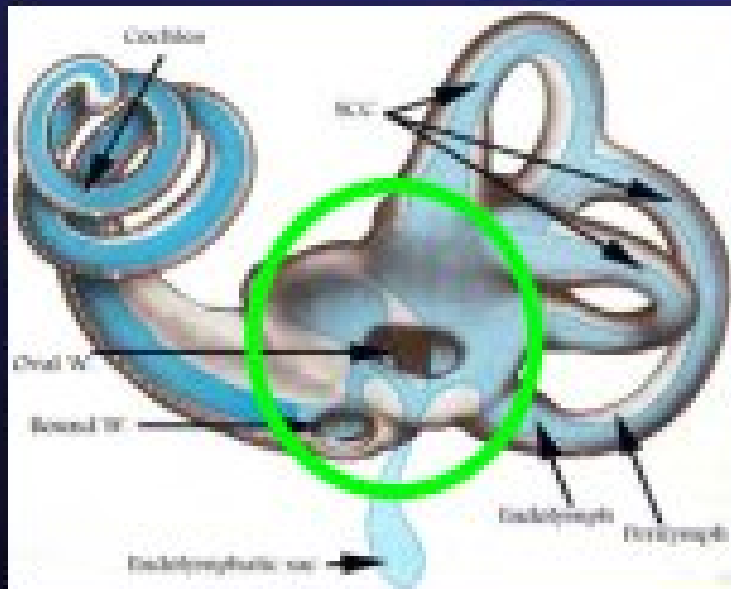


Inner Ear

Vestibular apparatus

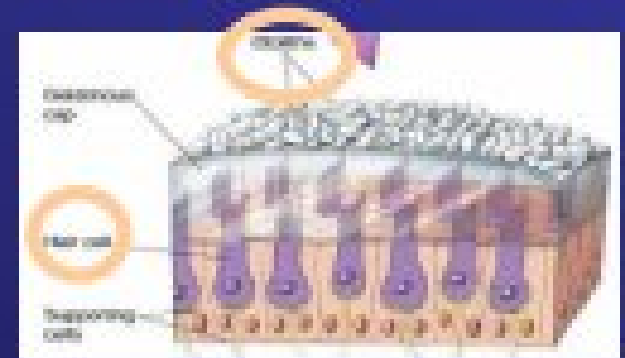
Vestibule

Linear acceleration

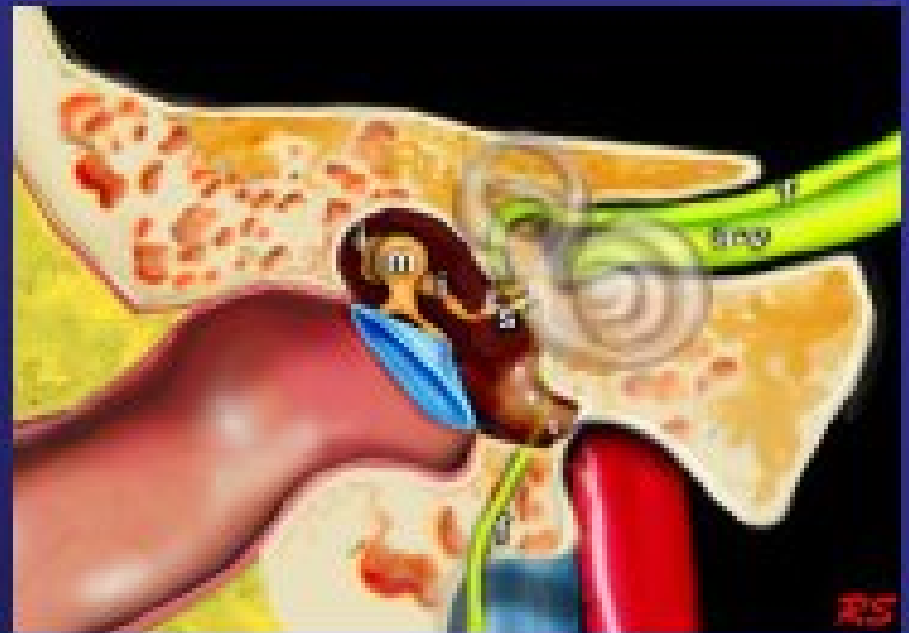


Utricle & Saccule

Maculae



Internal Auditory Canal



Facial Nerve
Vestibulocochlear Nerve

Blood supply internal ear

