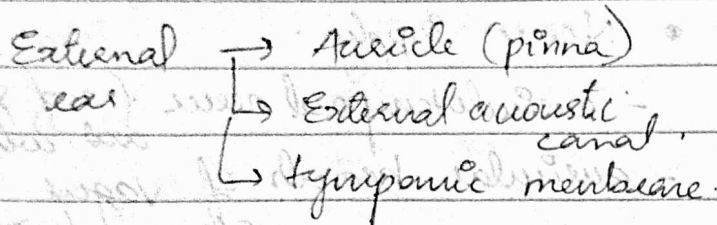
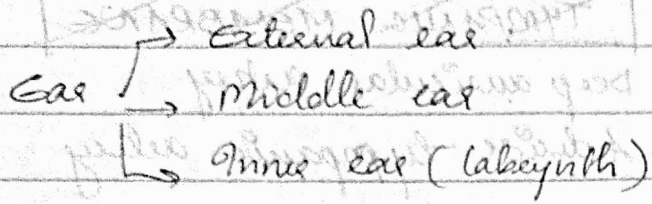


ANATOMY OF EAR :



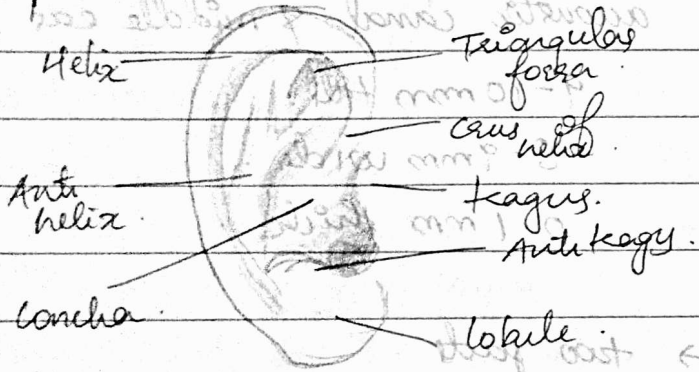
- Lymphatics
 - pre-auricular (parotid) LN
 - mastoid LN
 - upper gp of deep cervical LN

- Nerve Supply
 - motor supply - facial nerve
 - sensory supply :
 - ^{locally} lat. 1/3 → great auricular nerve

PINNA

- elastic cartilage with skin

parts :



- upper 2/3 - auriculotemporal
- concha - auricular br. of vagus
- upper 2/3 (cranial surface)
 - ↳ lesser occipital nerve

Clinical Relevance :

- source of graft material
- incision for ext. auditory meatus done @ Incisura terminalis

- Incisura terminalis : area ① b/w tragus and crus of helix where there is NO cartilage

Arterial supply

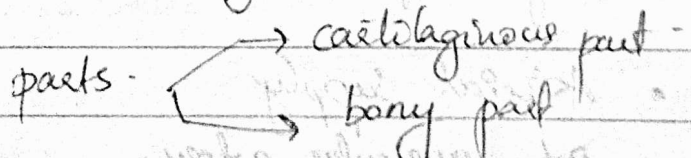
- post. auricular br. of ext. carotid artery (canal & post part of lat. surface)
- sup. temporal artery (ant. & post of lat. surface)

Venous drainage

- Superficial temporal & external jugular

EXTERNAL ACOUSTIC CANAL

- from concha to tympanic membrane
- 24mm long



(i) cartilaginous part

→ 8 mm

→ two deficiencies

fissures of Santorini

way for infection to canal.

→ skin thick

eccrine & sebaceous

glands → sweat wax

→ outer $\frac{1}{3}$ has hairs.

TYMPANIC MEMBRANE

- Deep auricular artery

- Anterior tympanic artery

• Nerve Supply

- auriculotemporal nerve (roof & ant. wall)

- auricular branch of vagus floor, post wall.

(ii) Bony part

→ 16 mm

→ thin skin, no hairs, glands

→ narrow → Isthmus

→ recess near isthmus

anterior recess

→ for discharge / debris

→ Foramen of Muschke

↓
deficiency in ant. inf. part of bony canal in children

upto 4 years / adults

spread of infection to & from middle ear

• Arterial supply

- Post. auricular artery

TYMPANIC MEMBRANE

→ Partition b/w external acoustic canal & middle ear

9-10 mm tall

8-9 mm wide

0.1 mm thick

→ two parts

① Pars Tensa

- most of TM

- periphery thickened to a fibrocartilaginous ring - annulus tympanicus

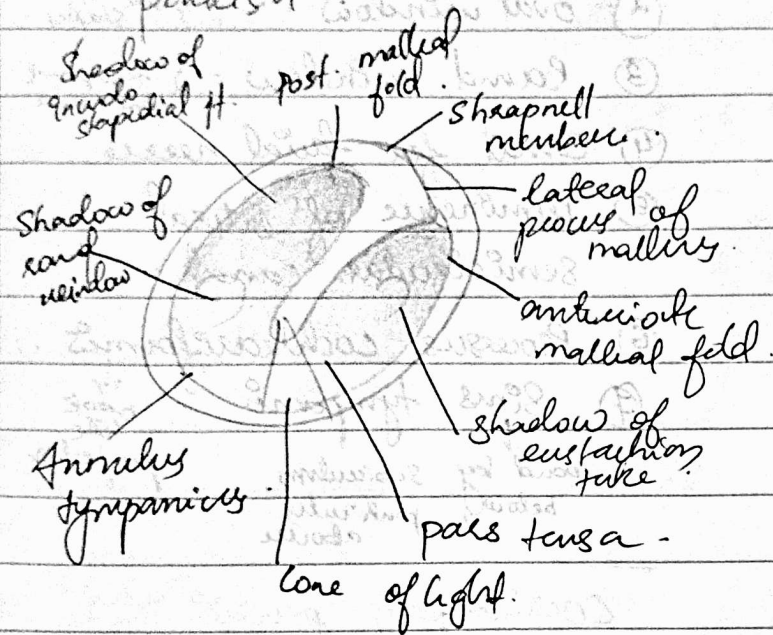
- central part tinted pinkish at level of malleus umbo

- cone of light

② Pars Flaccida

- above lateral process of malleus b/w notch of living & ant. & post. malleal folds.

- Not so taught, pinkish



• Nerve Supply

Ant. 1/2 → auriculo Temporal

Post. 1/2 (lateral) - auricular br. of trig.

Medial - tympanic br. of glossopharyngeal N

MIDDLE EAR

- eustachian tube + aditus
- + antrum + mastoid air cells
- + middle ear → middle ear cleft.

• Layers of TM, str. squamous.

→ outer epithelial layer.

Inner mucosal layer, low columnar.

middle fibrous layer.

(radial, circular, prelobular fibres).

→ divided into.

(i) Mesotympanum

(ii) Epitympanum

(iii) Hypotympanum

→ Six sided box :-

BOUNDARIES :-

ROOF :- tegmen tympani
tegmen otici (posterior)

FLOOR :- thin plate of bone separating the tympanic cavity from jugular bulb. Sometimes deficient congenitally - only mucosa.

tympanic br. of GPIN pierces floor → tympanic plexus.

• Blood supply.

- deep auricular artery (aorta)

- anterior tympanic A. (inner post. tympanic artery)

venous :- outer → ext. jug.

inner - transverse sinus

pharyngeal venous plexus.

ANTERIOR WALL :

- thin plate of bone
- separates from ICA
- 2 openings for
 - tensor tympani (upper one)
 - eustachian tube (lower one)

POSTERIOR WALL :

separates tympanic cavity from mastoid antrum & mastoid air cells.

features :

- Pyramid. (bony projections, through the summit of which tendon of stapedius get attached to neck of stapes)
- Aditus (opening in upper part through which TC communicates with mastoid antrum)
- Facial recess (depression in post. wall lateral to pyramid)
 - * Facial nerve runs through post. wall behind the pyramid.

MEDIAL WALL :

separates TC from internal ear.

formed by labyrinthine features :

- Promontory (bulge due to basal wall of cochlea)
- oval window - footplate of stapes
- Round window - 2^o tympanic membrane
- Canal for facial nerve
- Prominence of lateral semicircular canal.
- Processus cochleariformis.
- Genus tympani
 - hook like projection
 - bound by subiculum below, particularly above.

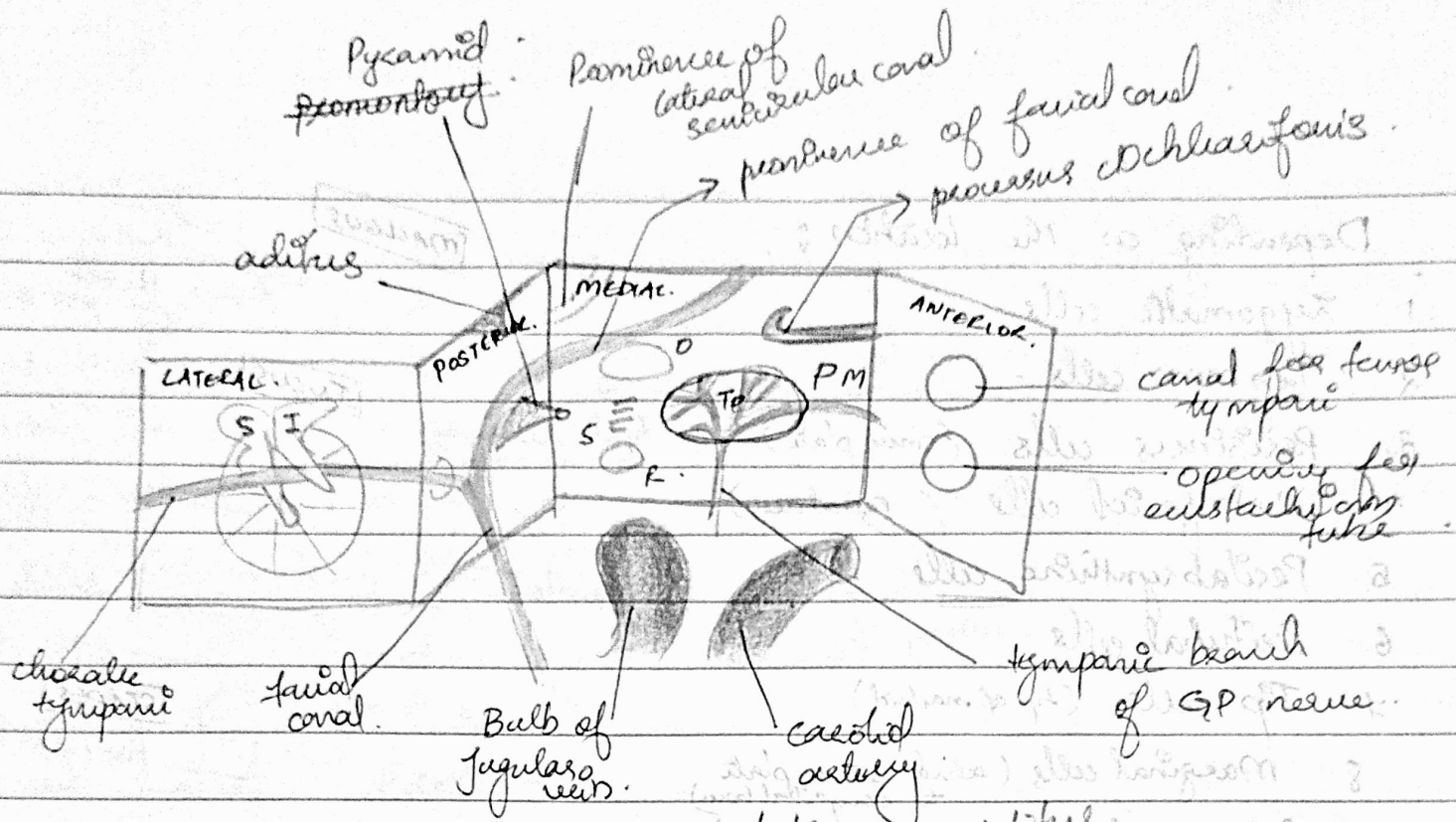
Cochleariform process.

- tendon of tensor tympani turns here to get attached to upper part of handle of malleus
- level of 1st genu of facial nerve.

LATERAL WALL :

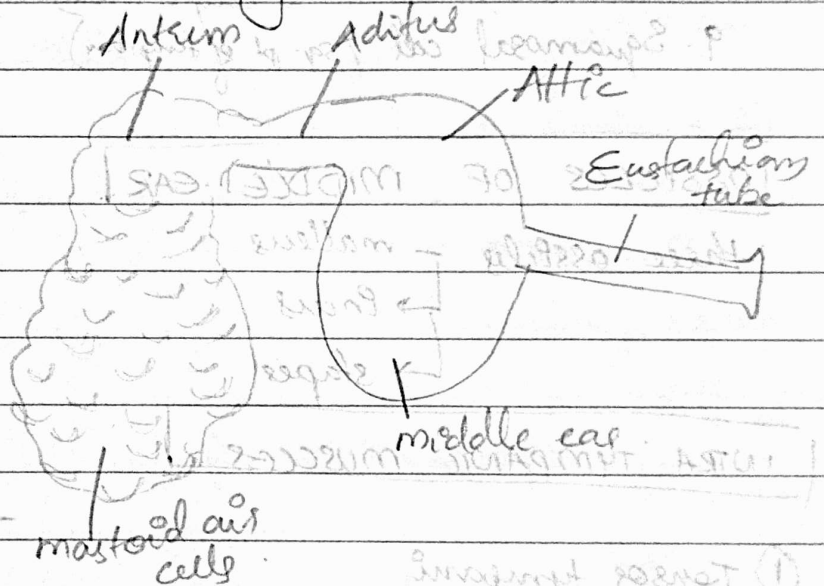
- formed by tympanic membrane & Scutum
- tympanic membrane is semi transparent
- window to middle ear.

- long process of malleus
- encudostapedial ft.
- round window.



MASTOID ANTRUM

- large air containing space in upper part of mastoid.
- communicates with attic through aditus
- roof - tegmen ant.
- marked externally on surface of mastoid by supra-meatal (Mac Ewen's) triangle



ADITUS AD ANTRUM.

- Aditus - opening through which attic communicates with the antrum.

MASTOID AND ITS AIR CELL SYSTEM

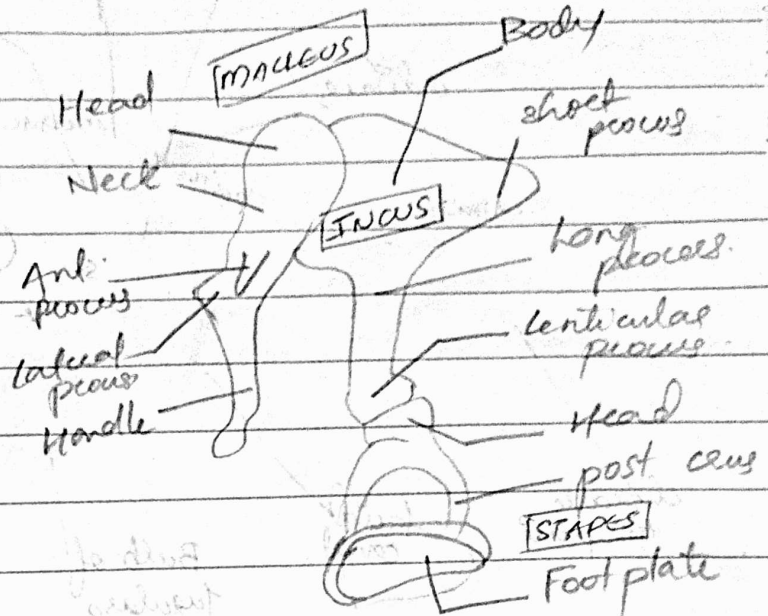
- bony cortex with 'honeycomb' of air cells underneath

Based on development.

- Well pneumatized (or cellular)
- Diploetic (massive spaces & few air cells)
- Sclerotic or acellular

Depending on the location :

1. Zygomatic cells
2. Tegmen cells
3. Perisphenoid cells (sinus plate)
4. Retrosphenoid cells (fauces)
5. Petrosphenoid cells
6. Petrotubal cells
7. Tip cells (tip of mastoid)
8. Marginal cells (behind sinus plate to occipital bone)
9. Squamosal cell (sq. pt. of temp. bone)



OSSELES OF MIDDLE EAR

three ossicles - malleus
→ incus.
→ stapes.

Insertion: post. aspect of neck
of scapula

Nerve : Facial nerve
(2nd arch) .

INTRA TYMPANIC MUSCLES

① Tensor tympani:

origins - cartilaginous pt of
auditory tube.

insertion: medial aspect of upper end of handle of malleus.

Nerve supply: Mandibular N.
(develops from 1st arch)

(2) Stapedius

oxygen - interior of pyramidal eminence

TYMPANIC PLEXUS.

(ii) Sympathetic fibres from plexus around the ICA.

- supply - medial surface of
tympanic membrane, tympanic cavity,
mastoid air cell, bony eustachian

fake

① Vestibule.

- central chamber.
- oval window in lat. wall.
- 2 recess in med. wall.
- spherical recess (sacculus)
- elliptical recess (utricle).
- Below elliptical recess, opening of aqueduct of vestibule.
- post. sup. pt → 5 openings of semicircular canals.

osseous spiral lamina:

- $\frac{2}{3}$ bony cochlea completely.
- gives attached to basilar membrane.

→ bony cochlea has 3 compartments

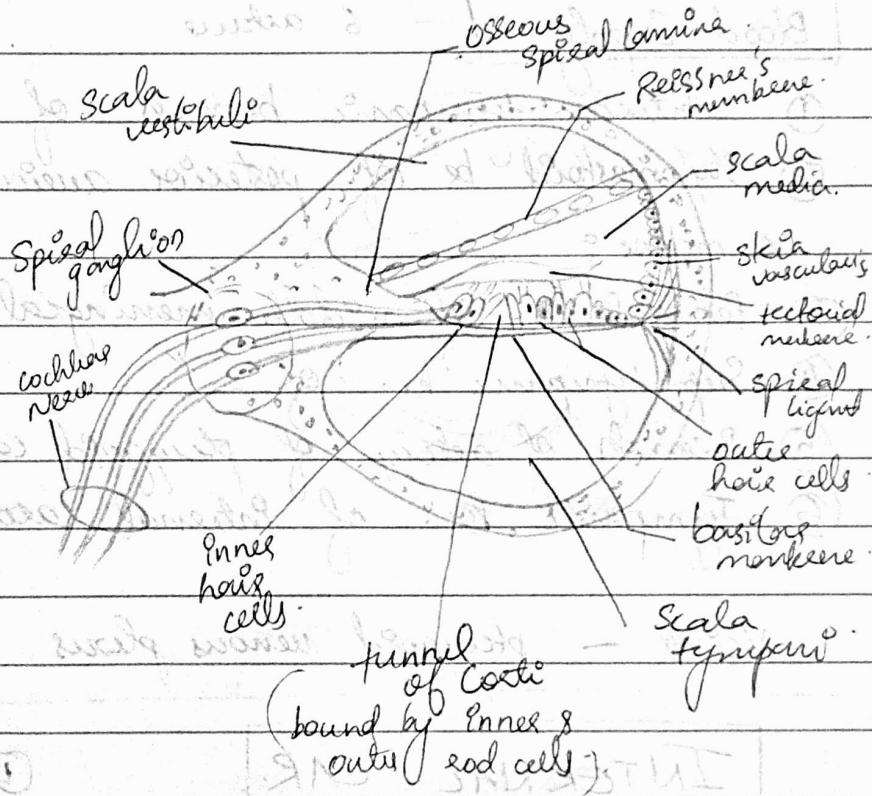
(a) Scala vestibuli.

(b) Scala tympani.

(c) Scala media (membranous cochlea).

② Semicircular canals.

- 3 - lat, post. sup.
- right angles to each other
- 2 ends - ampullated & non ampullated.
- non ampullated unite to form - crus commune.



③ Cochlea:

Bony cochlea - coiled tube.

- 2.5 - 2.75 turns around central pyramid of bone - called modiolus.

- And the modiolus & winding like the thread of a screw - thin plate of bone called osseous spiral lamina.

- Scala vestibuli and scala tympani are filled with perilymph & communicate with each other at apex of cochlea through helicotrema.

Lymphatics

- Pre auricular & parotid → concha, tragus, forsa Δ , ext. ear canal.
- Infra auricular → lobule, antitragus.
- Post auricular, deep jugular, spinal accessory — Helix, antihelix.
- Retropharyngeal — Middle ear & eustachian tube.
- Inner ear — NO LYMPHATICS.

Blood Supply — 6 arteries

- ① Anterior tympanic branch of maxillary artery
- ② Stylomastoid br. of posterior auricular A. — middle ear, mastoid air cells.

4 more:

- ③ Petrosal br. of middle meningeal artery
- ④ Sup. tympanic br. of "
- ⑤ Branch of artery of pterygoid canal
- ⑥ Tympanic br. of internal carotid.

Veins — pterygoid venous plexus & sup. petrosal sinus.

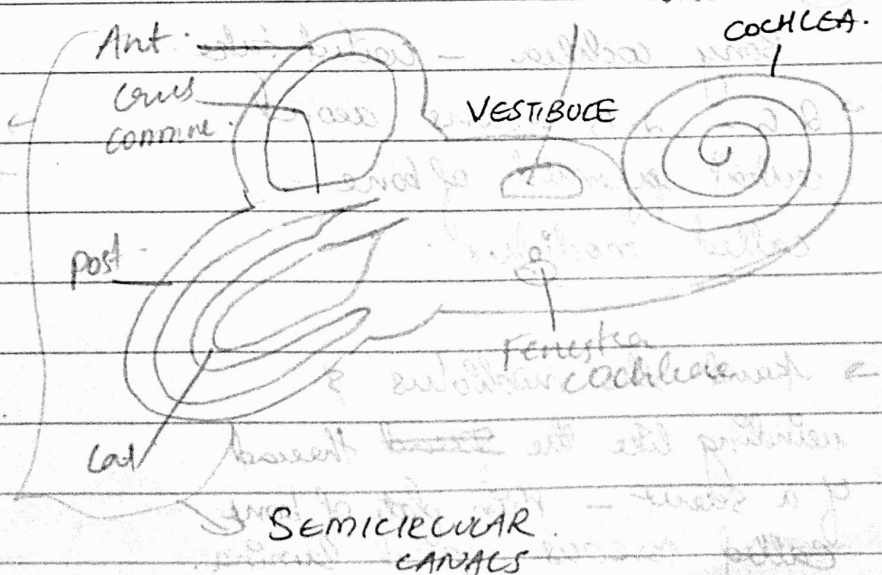
INTERNAL EAR

Labyrinth $\begin{cases} \rightarrow \text{bony} \\ \rightarrow \text{membranous} \end{cases}$

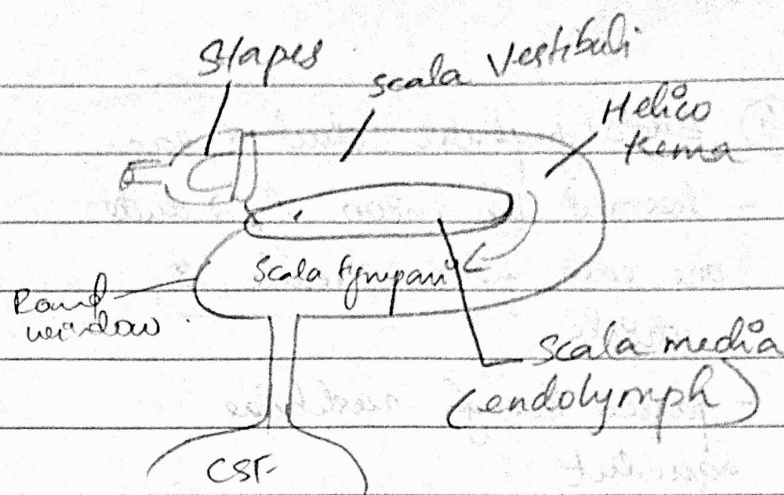
Bony Labyrinth:

parts $\begin{cases} \rightarrow \text{vestibule} \\ \rightarrow \text{Semicircular canal} \\ \rightarrow \text{cochlea} \end{cases}$

① Vestibule: Fenestra Vestibuli



- Scala vestibuli closed by footplate of stapes
- Scala tympani closed by secondary tympanic membrane. also connected to a subarachnoid space through the aqueduct of cochlea.



MEMBRANOUS LABYRINTH

- parts → cochlear duct
- utricle & saccule
- Semicircular ducts
- Endolymphatic duct & sac.

① cochlear duct

- membranous cochlea / scala media
- blind coiled tube
- Δ on cross section

3 walls:

- basilar membrane
- Reissner's membrane
- stria vascularis

- connected to saccule by ductus reuniens
- length of basilar membrane $\uparrow$ from basal to apical coil

Higher freq. - basal coil

lower freq. - apical coil

② Utricle and saccule

- Utricle - lies in post. part of bony vestibule.
- receives 5 openings of semicircular ducts.
- sensory ep. called macula (linear acc. & deceleration)

Saccule

- lies in bony vestibule, ant. to utricle.
- sensory ep. called macula.

Meniere's disease: distended saccule lies against stapes footplate.

Surgically decompressed by perforating the footplate.

③ Semicircular ducts

- ampullated end of each duct contains a thickened ridge of neuroepithelium - crista ampullaris

INNER EAR FLUIDS AND THEIR CIRCULATION

(1) Endolymphatic duct & sac

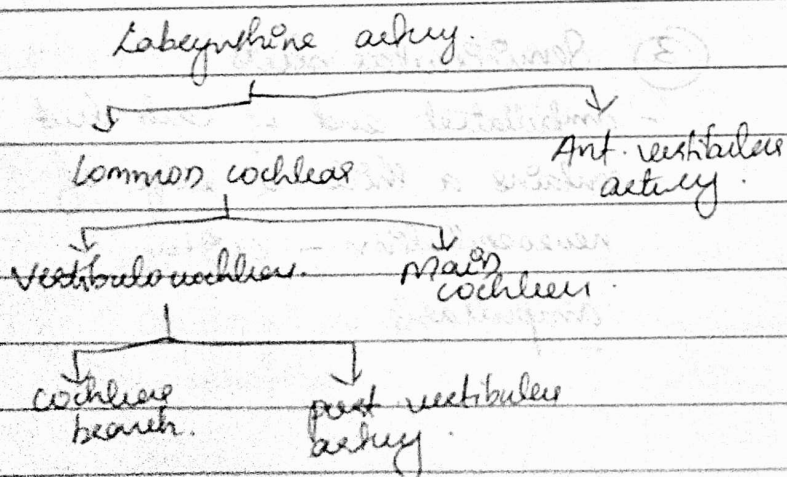
- formed by union of 2 ducts one each from saccule & utricle
- passes through vestibular aqueduct
- terminal part - endolymphatic sac $\rightarrow$ lies b/w 2 layers of dura on posterior surface of petrous bone

Blood supply of labyrinth

Arterial - labyrinthine artery
(br. of ant. inf. cerebellar art.)

Venous $\rightarrow$ Internal auditory vein
 $\rightarrow$ vein of cochlear aqueduct
 $\rightarrow$ vein of vestibular aqueduct

decuss $\downarrow$ to Inferior petrosal sinus and lateral venous sinus



Perilymph

- Resembles ECF, rich in Na^+
- fills space b/w bony & membranous labyrinth
- communicates with CSF via aqueduct of cochlea

Endolymph

- fills entire membranous labyrinth
- Resembles ICF, rich in K^+ ions
- secreted by secretory cells of stria vascularis (cochlea) & dark cells (utricle, ampullated ends of semicircular ducts)

2 views regarding flow

(i) Longitudinal

endolymph $\leftrightarrow$ cochlea $\rightarrow$ saccule, utricle, endolymphatic duct
 $\downarrow$
 absorbed through endolymphatic sac

(ii) Radial - secreted &

absorbed by stria vascularis