EAR

DISCUSS MIDDLE EAR UNDER FOLLOWING HEADINGS: (a) WALLS (b) OSSICLES (c)MUSCLES (LE)

Middle ear:

is a narrow air filled space located in petrous part of temporal bone between external ear & internal ear

Walls:

Middle ear is roughly cuboidal in shape, therefore it has 6 walls- Roof, Floor, Anterior wall , Posterior wall, Medial wall and Lateral wall

Roof:

formed by Tegmen tympani which separates middle ear from middle cranial fossa

Floor :

floor is related to the superior bulb of internal jugular vein

Anterior wall: (narrow)

Upper part – bears opening of canal of tensor tympani

Middle part – opening of auditory tube

Posterior wall :

Aditus – through which epitympanic recess communicates with mastoid antrum

Fossa incudis – depression which lodges short process of incus

Vertical part of bony facial canal up to stylomastoid foramen

Pyramidal eminence –is a conical projection from upper part of facial canal. It has an opening at its apex for passage of tendon of stapedius

Posterior canaliculus of chordatympani nerve – through which nerve enters middle ear cavity

Medial wall shows the following features:

Promontory – rounded elevation produced by basal turn of cochlea. Tympanic branch of glossopharyngeal nerve ramifies over it & forms tympanic plexus

Fenestra vestibuli or oval window- is an aperture above the promontory and is closed by the foot plate of stapes

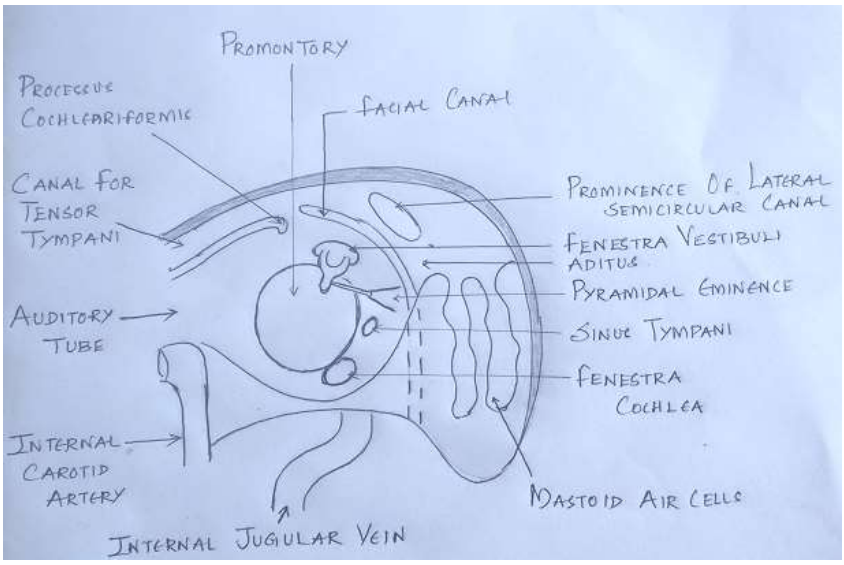
Fenestra cochlae or round window lies below the promontory and is closed by a membrane (secondary tympanic membrane)

Sinus tympani is depression behind promontory and indicates position of ampulla of posterior semicircular canal.

Oblique part of facial nerve canal – extends backwards above fenestra vestibuli

Processus cochleariformis – hook like process formed by backward extension of bony partition between canals for tensor tympani & auditory tube

Prominence of lateral semicircular canal above facial canal



Lateral wall :

Separates middle ear from external acoustic meatus

Formed mainly by tympanic membrane and epitympanic recess

Close to anterior margin of tympanic membrane 2 apertures seen

Anterior canaliculus for chordatympani nerve through which the nerve leaves middle ear

Posterior canaliculus for chorda tympani nerve through which it enters the tympanic cavity

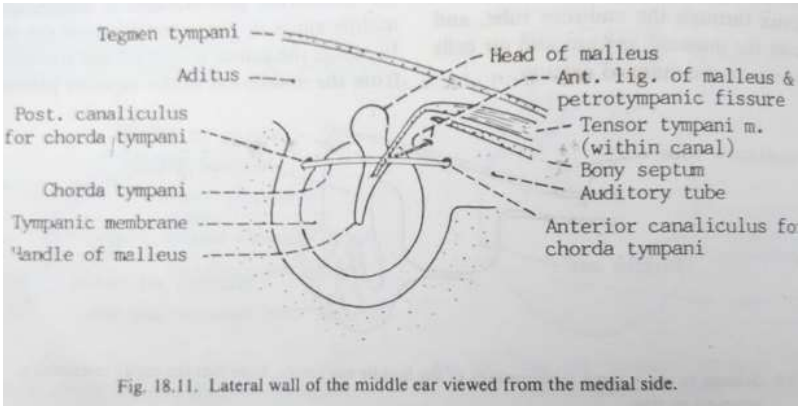


Fig. 18.11. Lateral wall of the middle ear viewed from the medial side.

Ossicles: Are three in number

Malleus

Incus

Stapes

Malleus: (largest ossicle)

Parts :

Rounded Head- articulates with incus

Neck

Anterior process is connected by anterior ligament of malleus to spine of sphenoid

Lateral process

Handle -embedded in fibrous layer of tympanic membrane

Incus:

Parts

Body

Short process

Long process

Stapes:

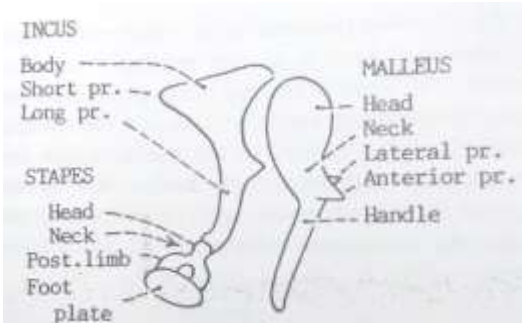
Parts :

Head

Neck-receives insertion of tendon of stapedius

Anterior & Posterior Limbs -attached to foot plate

Foot plate/ base- fits into fenestra vestibuli



Muscles

MUSCLE	ORIGIN	INSERTION	NERVE SUPPLY	ACTION
1.TENSOR TYMPANI	-Cartilagenous part of auditory tube - sulcus tubae	Handle of malleus	Mandibular nerve	Tenses tympanic membrane
2.STAPEDIUS	pyramidal eminence	Neck of stapes	Facial nerve	Draws stapes laterally
Both muscles act together to damp down intensity of high pitched sound & protect internal ear				

TYMPANIC MEMBRANE / LATERAL WALL OF MIDDLE EAR (SE)

Tympanic membrane is thin, oval membrane between external acoustic meatus & middle ear.

Position:

placed obliquely at an angle of 55° to floor of external acoustic meatus

Surfaces:

Outer surface – concave covered by non hairy stratified squamous keratinized epithelium

Inner surface – convex – gives attachment to handle of malleus which is known as umbo.

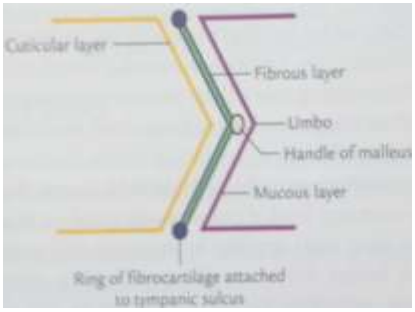
Chorda tympani nerve passes across the membrane in this region. It is lined by simple columnar epithelium.

It is made up of three layers. (Trilaminar)

Outer cuticular layers -derived from ectoderm

Intermediate fibrous layer – derived from mesoderm

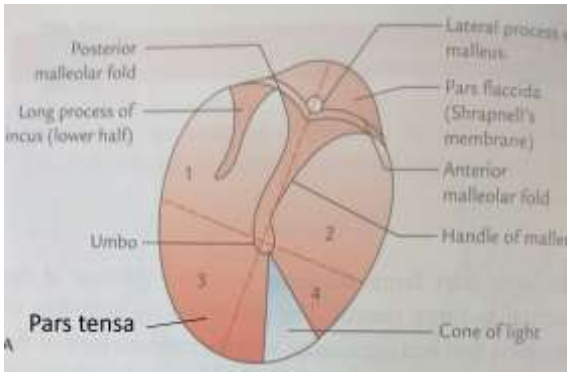
Inner mucous layer- derived from endoderm



Parts

Pars flaccida – small laxed part of tympanic membrane in upper part.

Pars tensa – stretched part which forms rest of tympanic membrane.



Clinical examination:
When tympanic membrane is illuminated, cone of light is produced in the anteroinferior quadrant.
Beneath tympanic membrane, handle & lateral process of malleus, long process of incus is seen.

Applied anatomy:
Myringotomy :

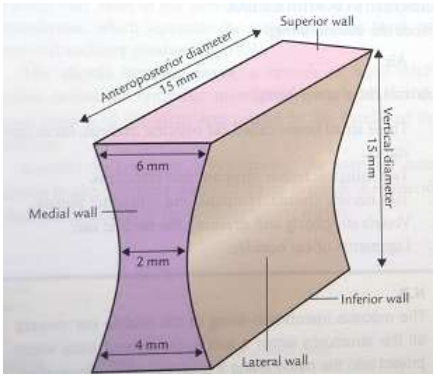
In Otitis media – to drain pus from middle ear – incision is made in anteroinferior quadrant of tympanic membrane to avoid injury to chorda tympani nerve & ossicles

TYMPANIC CAVITY (SE)

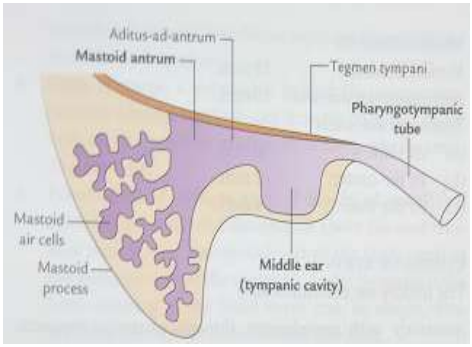
It is a narrow air filled space located in petrous part of temporal bone between external ear & internal ear

Shape & size:

Middle ear is roughly cuboidal in shape.



On coronal section – biconcave disc



Section through long axis of petro mastoid bone

Communications :

Anteriorly – auditory tube

Posteriorly – mastoid antrum

Parts :

Epitympanum

Mesotympanum

Hypotympanum

Walls: - 6 walls

Roof

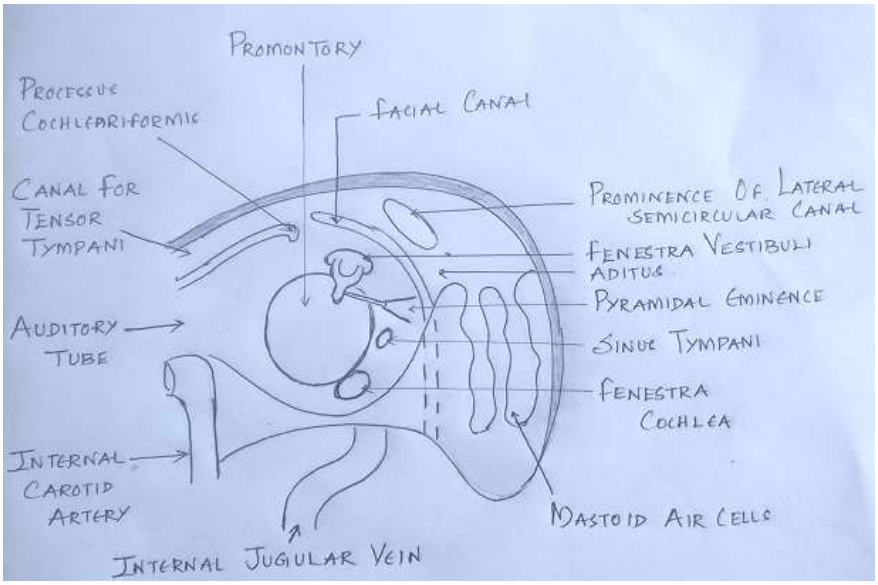
Floor

Anterior

Posterior

Medial

Lateral

- 

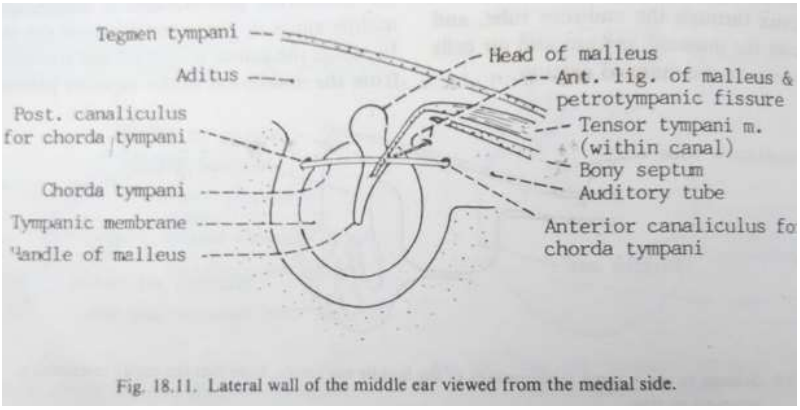


Fig. 18.11. Lateral wall of the middle ear viewed from the medial side.

<u>Contents</u> :

Ossicles – malleus , incus, stapes

Ligaments of ear ossicles

Muscles – tensor tympani & stapedius

Vessels -Anterior tympanic & Posterior tympanic artery & corresponding veins

Nerves - chordatympani nerve, tympanic branch of glossopharyngeal nerve , facial nerve, superior & inferior caroticotympanic nerves

Air

Ossicles :

3in number from lateral to medial

Malleus:

has rounded head ,neck ,anterior process,lateral process ,handle

Incus:

has body,short process, long process

Stapes:

has head, neck, anterior & posterior limbs, foot plate/ base

Muscles :

2in number

MUSCLE	ORIGIN	INSERTION	NERVE SUPPLY	ACTION
1.Tensor Tympani	-Cartilagenous part of auditory tube - sulcus tubae -Wall of canal it lies	Handle of malleus	Mandibular nerve (nerve to medial pterygoid)	Tenses tympanic membrane
2.Stapedius	-interior of pyramidal eminence	Neck of stapes	Facial nerve	Draws stapes laterally
Both muscles act together to damp down intensity of high pitched sound& protect internal ear				

Applied anatomy :

Otitis Media – infection of middle ear. Pus collected is drained by making incision in tympanic membrane

POSTERIOR WALL OF MIDDLE EAR (SE)

Posterior wall / mastoid wall is wider above than below

Features:

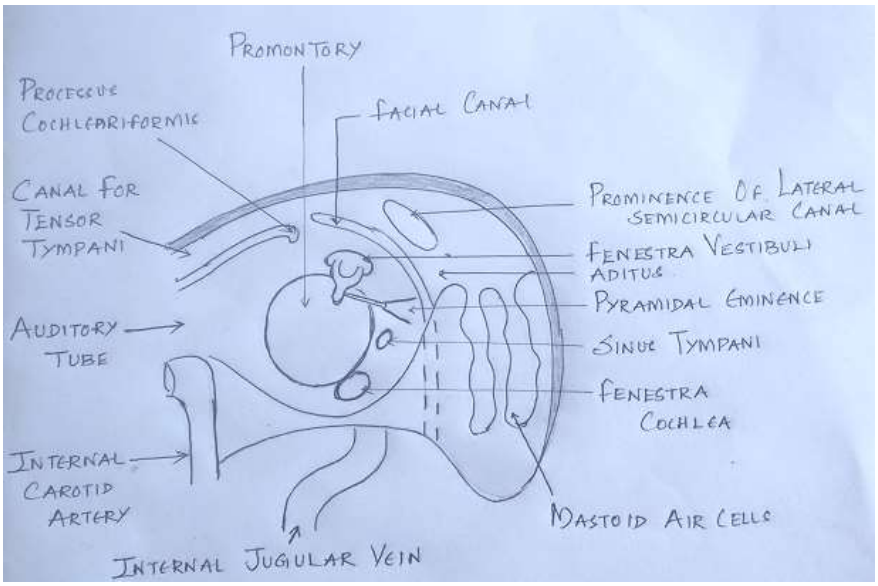
Aditus – through which epitympanic recess communicates with mastoid antrum

Fossa incudis – depression which lodges short process of incus

Vertical part of bony facial canal – facial nerve descends upto stylomastoid foramen

Hollow Pyramidal eminence – conical projection from upper part of facial canal. At its apex, there is an opening through which tendon of stapedius passes forward to neck of stapes

Posterior canaliculus of chordatympani nerve – through which chordatympani nerve enters middle ear cavity.



MEDIAL WALL (SE)

Shows the following features :

Promontory – rounded elevation produced by basal turn of cochlea. Tympanic branch of glossopharyngeal nerve ramifies over it & forms tympanic plexus

Fenestra vestibuli or oval window- is an aperture above the promontory and is closed by the foot plate of stapes

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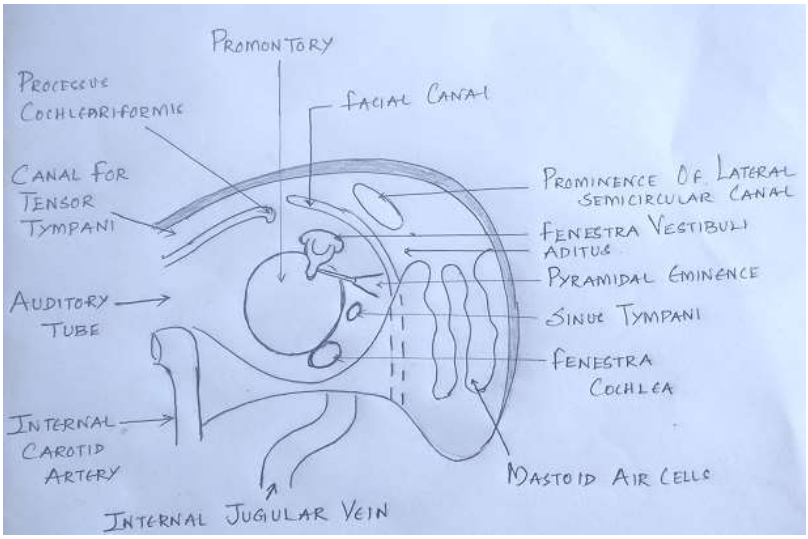

STRUCTURES IN TYMPANIC MEMBRANE (SA)

Trilaminar

Outer cuticular layer

Intermediate fibrous layer

-Superficial radiating fibres

-Deep circular fibres

-In pars flaccida fibrous layer replaced by loose connective tissue

Inner mucous layer – simple columnar epithelium with patches of ciliated cell

CONTENTS OF MIDDLE EAR (SA)

Middle ear contains -

Three Ossicles – Malleus, Incus, Stapes

Ligaments of ear ossicles

Two Muscles – Tensor tympani, Stapedius

Nerves (chordatympani nerve, tympanic branch of glossopharyngeal, facial nerve, superior & inferior caroticotympanic nerves)

Vessels supplying & draining middle ear (Anterior tympanic branch of maxillary artery, Posterior tympanic branch of stylomastoid artery & corresponding veins)

Air is present between the other contents.

NAME EAR OSSICLES (SA)

Ear ossicles are 3in number from lateral to medial:

Malleus - has rounded Head, Neck, Anterior process,Lateral process ,Handle

Incus - has Body,Short process, Long process

Stapes - has Head, Neck, Anterior & Posterior Limbs, Foot plate/ base