وَقُل رَّبِّ زِدْنِي عِلْمًا

النادي الطبي

PERIPHERAL NERVOUS SYSTEM

SUBJECT : Anatomy

LEC NO. : 3

DONE BY : Batool Alzubaidi & Hashem Ata

#كلينيكال_إلا_شحطة

The external, middle, inner ear & cranial nerve VII.

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Assistant Professor of anatomy and embryology.

ملاحظة صغيرة تفريغ محاضرة ٢ راح ينزل اليوم برضه بس بالليل بتقدروا تدرسوا هاي المحاضرة عادي هاي ما الها علاقة ب الي قبل تعون دكتور مصطفى محاضرة ٢ هستو هاي لدكتور اشرف

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

Petrous part of temporal bone » ear

Middle ear

الها امتدادين واحد امامي و واحد خلفي

Pharyngotympanic (auditory) tube

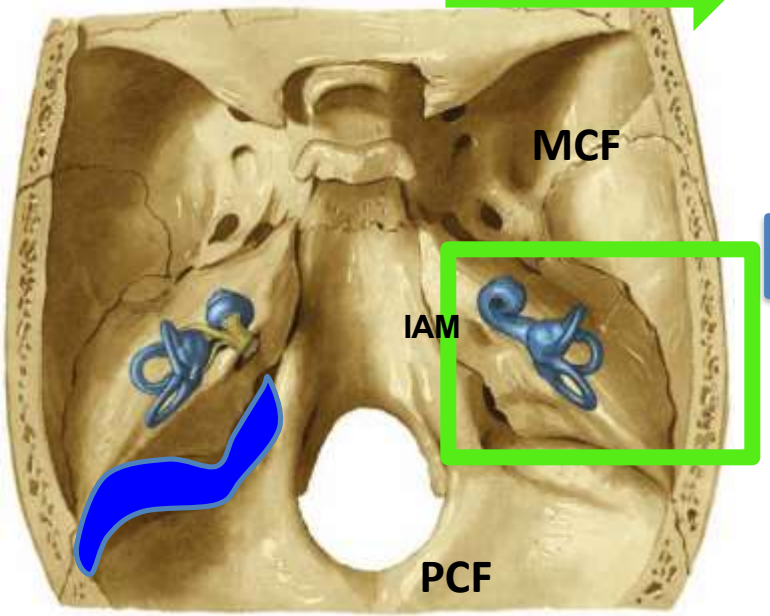
الامتداد الامامي

Internal carotid artery

MCF

IAM

External ear



Inner ear

PCF

Internal jugular vein

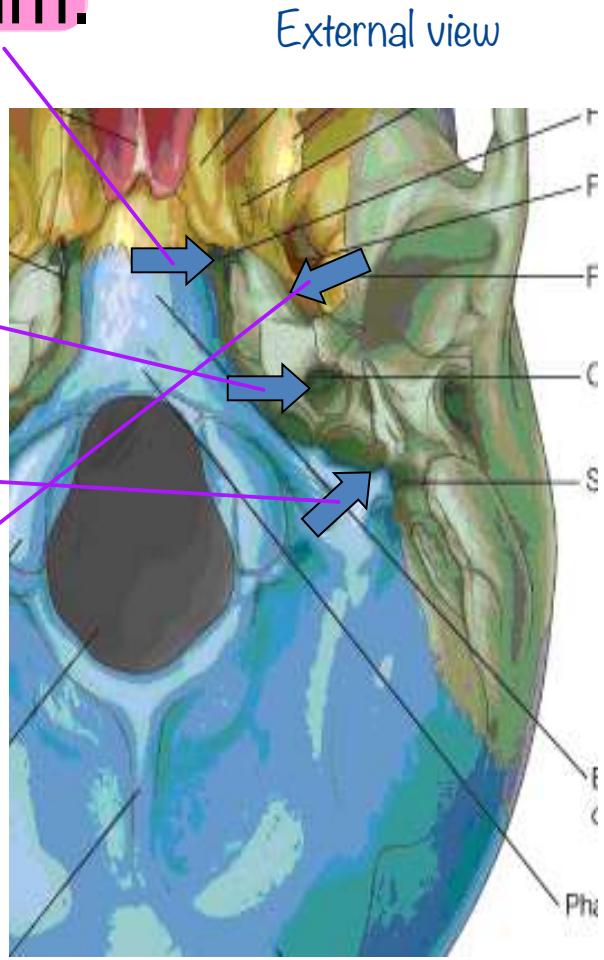
الامتداد الخلفي

Mastoid antrum & air cells

Sigmoid sinus

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.

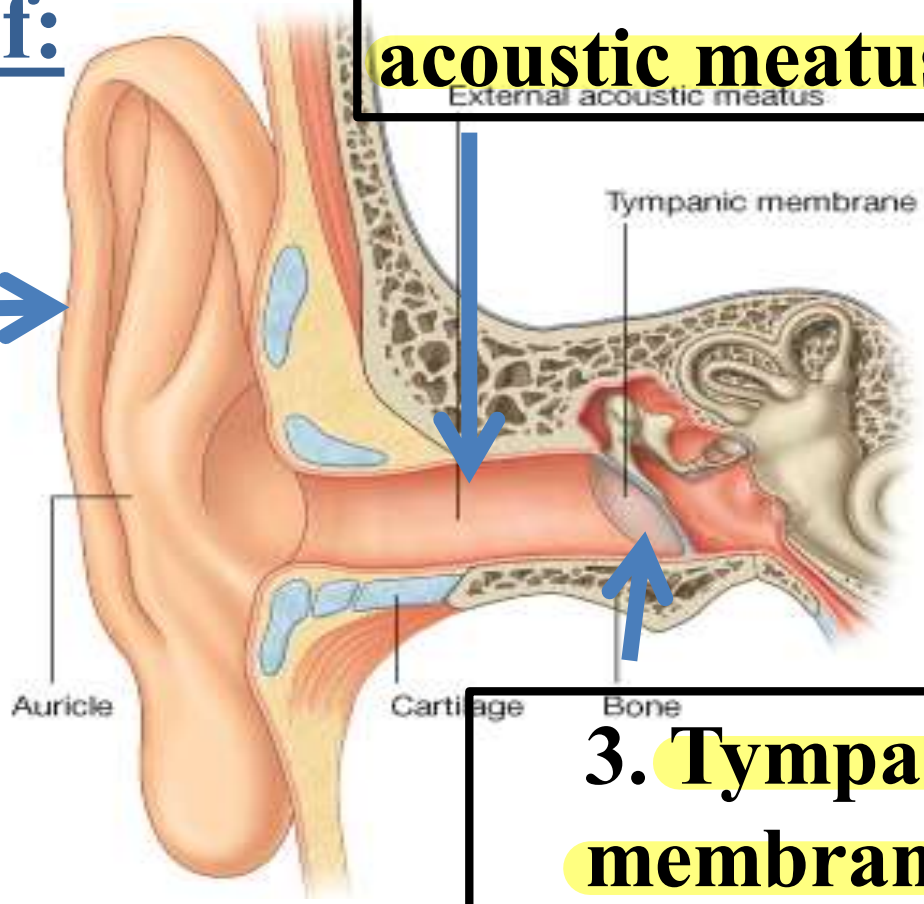


External Ear

Composed of:

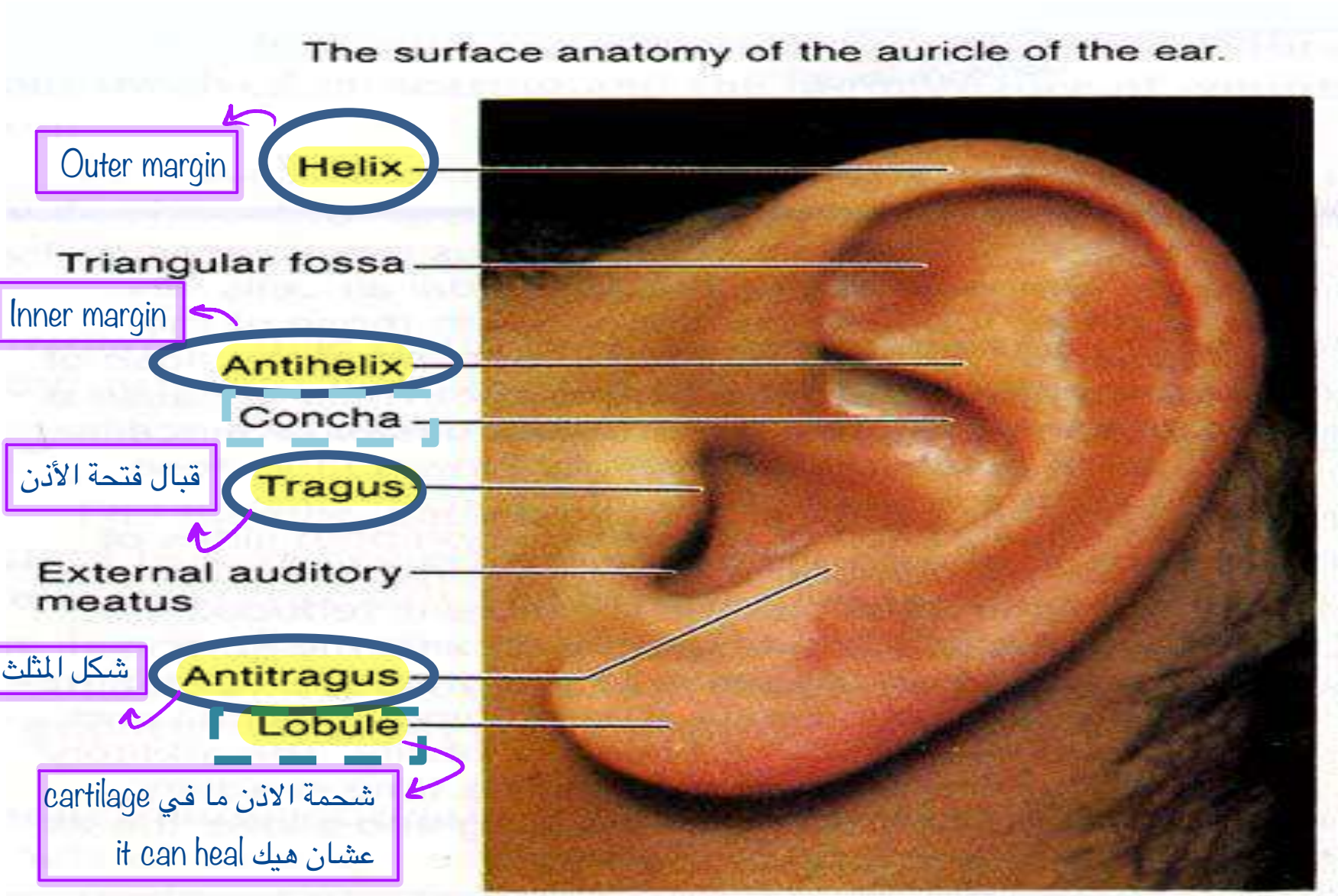
1. **The auricle (pinna)**

2. **External acoustic meatus**



3. **Tympanic membrane**

A- The Auricle



للناس الي بعملوا piercing لا تعملوه بمكان فيه cartilage لانه ال blood supply اله قليل جدا و هاد الي بخلي عملية ال healing تكون جدا بطيئة و بتكون عرضة المنطقة يصير فيها infection و وقتها هاد الاشي حيكون سيء حتى لو اي injury صارت بالاذن ما تخيط الجرح لانه راح يصير fibrosis و يصير شكلها زي الزهرة/القرنبيط

اي اصابة بتصير بالاذن بياخدوا قطعة من الجلد من ورا الدان و بغطوها فيها عشان يسرعوا عملية ال healing و يحموها من ال infection و غيرها

ولو انقطعت الدان بزرعوها بالجلد او بالبطن عشان يصيرلها healing بعدين برجعوها مكانها و بياخدوا قطعة من الجلد من ورا الدان و بغطوها فيها كمان

Sensory Supply of The Auricle

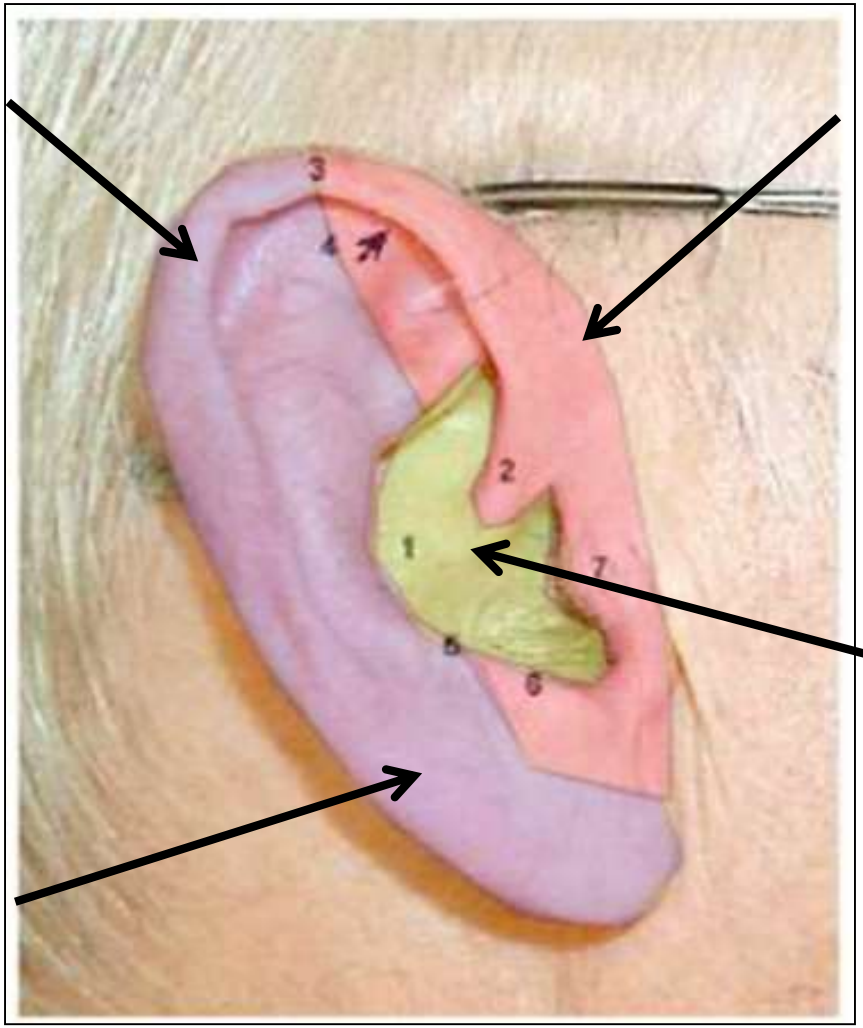
Lesser occipital

Upper part of posterior part of ear

▪**cervical plexus**

Lower part of posterior part of ear & lobule

Great auricular



▪**Auriculotemporal branch of the mandibular nerve [V_3].**

Cranial nerves

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

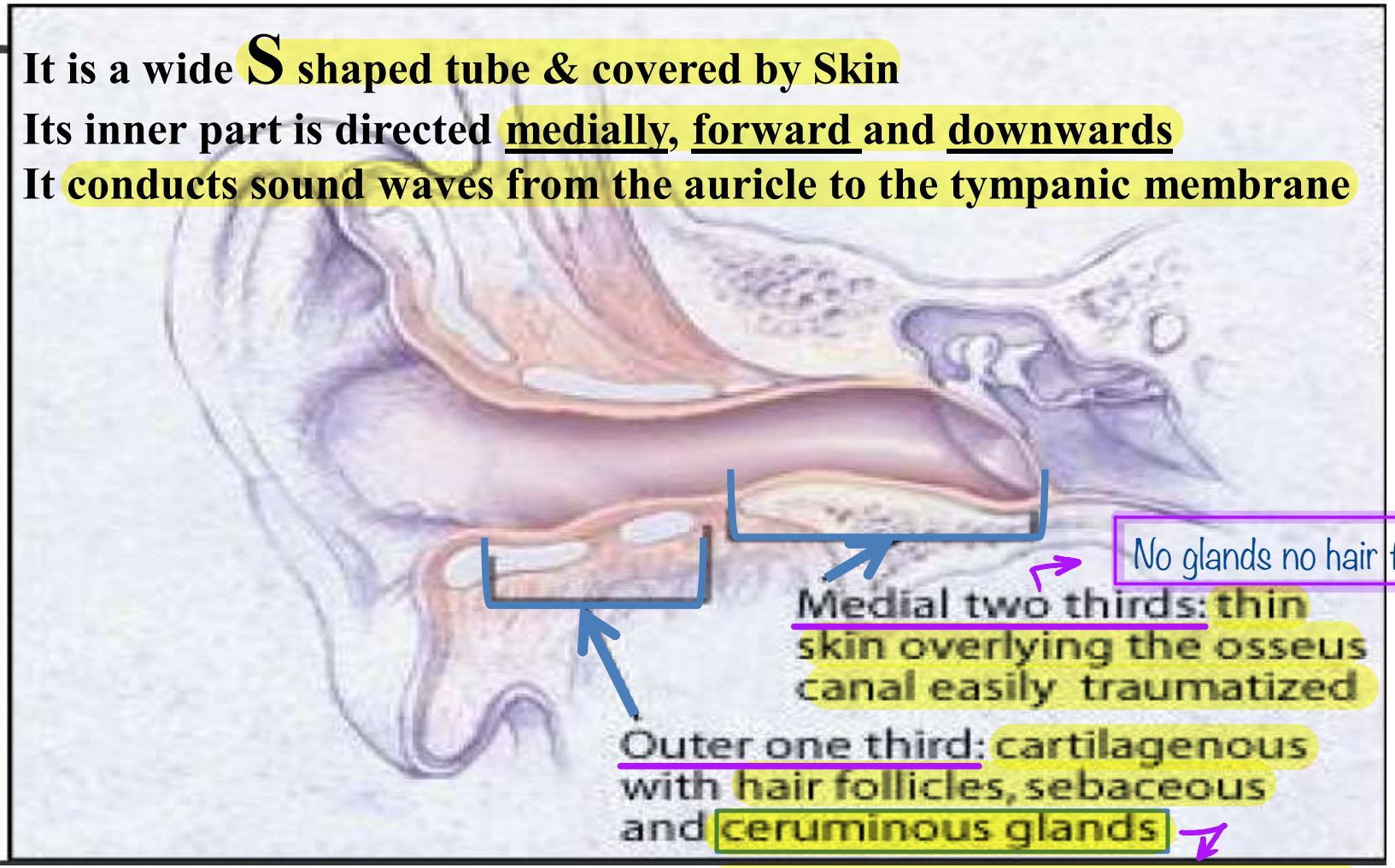
عشان هيك ال special senses بكون فيها sensation

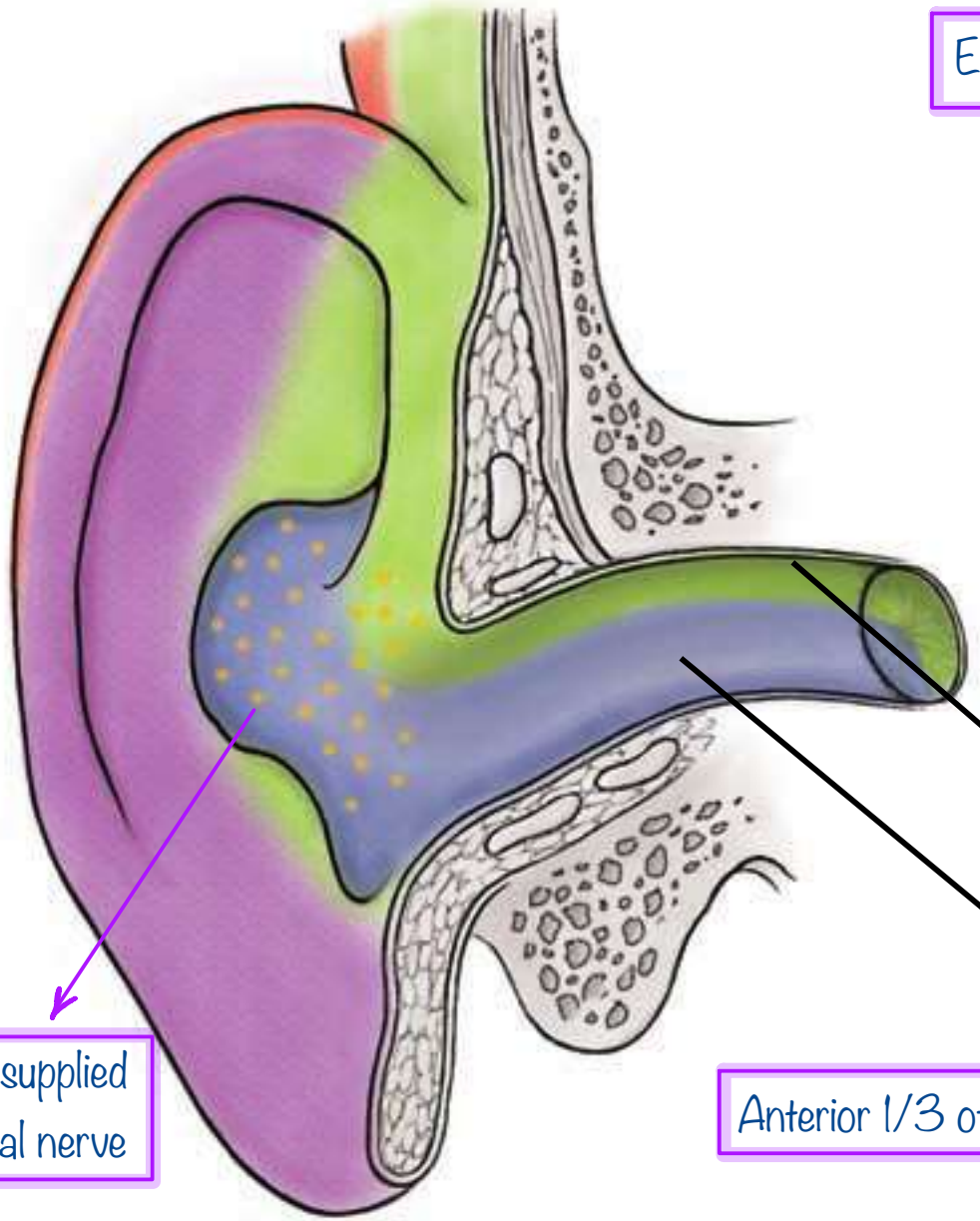
B- External Auditory Meatus

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





External ear very sensitive to pain

Areas supplied by facial nerve

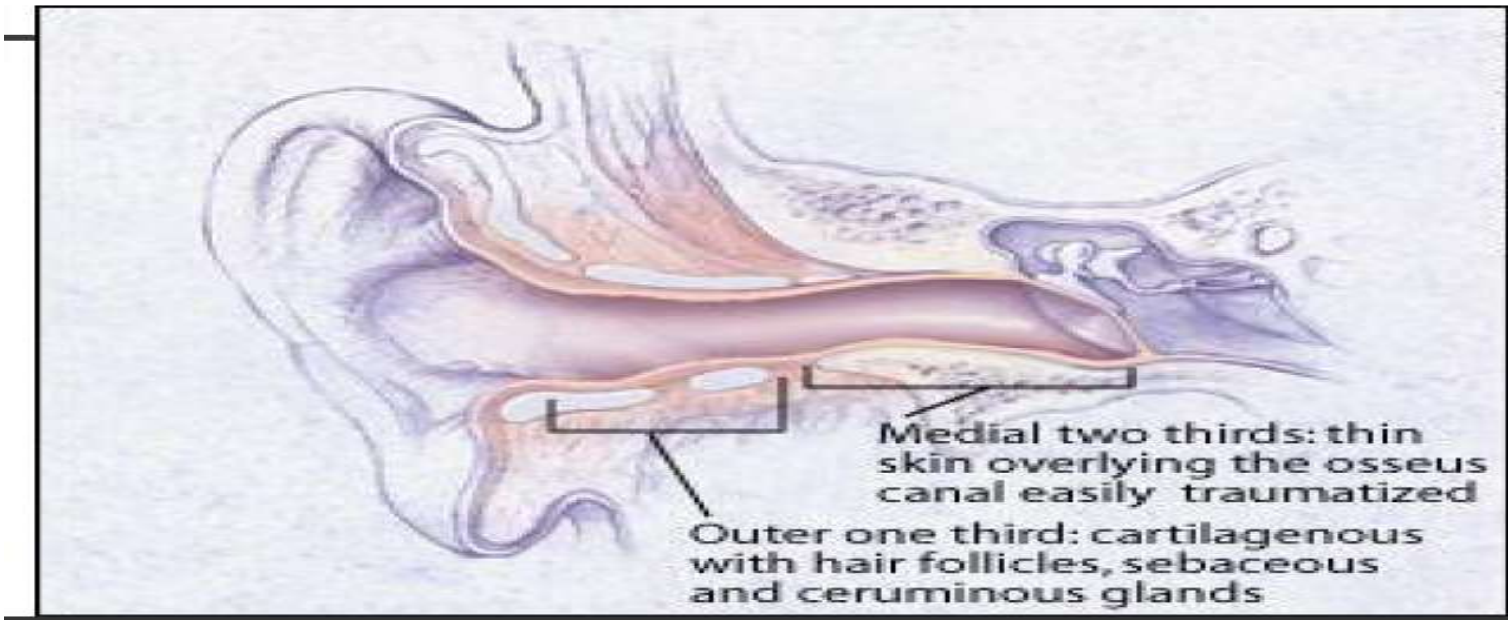
Posterior 2/3 of the canal

Auriculotemporal (CN V3)

Anterior 1/3 of canal

Auricular branch of vagus (CN X)

مصنه بحاضرة بكرة



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.

انت جرب هلا ادفش صيوان الاذن للامام راح تحس انه الصوت صار اعلى ليش ؟ عشان ال canal صارت more straight

C- Tympanic Membrane

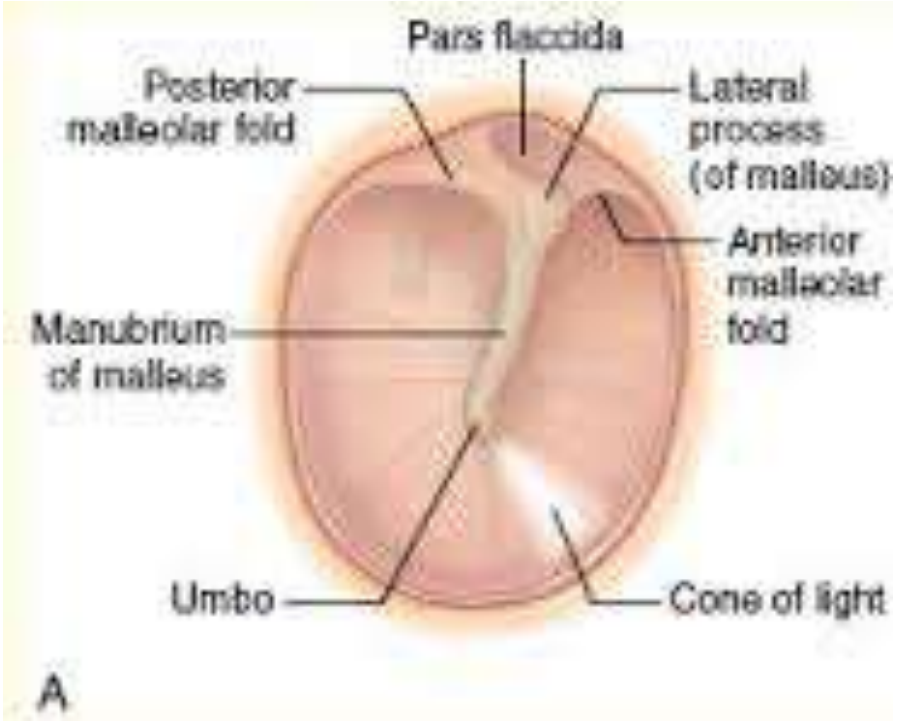
حكى راح يسألنا عن ال lesions
و يطلع عينا (حكاها ضاحكاً)
بس اتوقع صار عنا trust issues
منه انتبهوا على ال lesions

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**

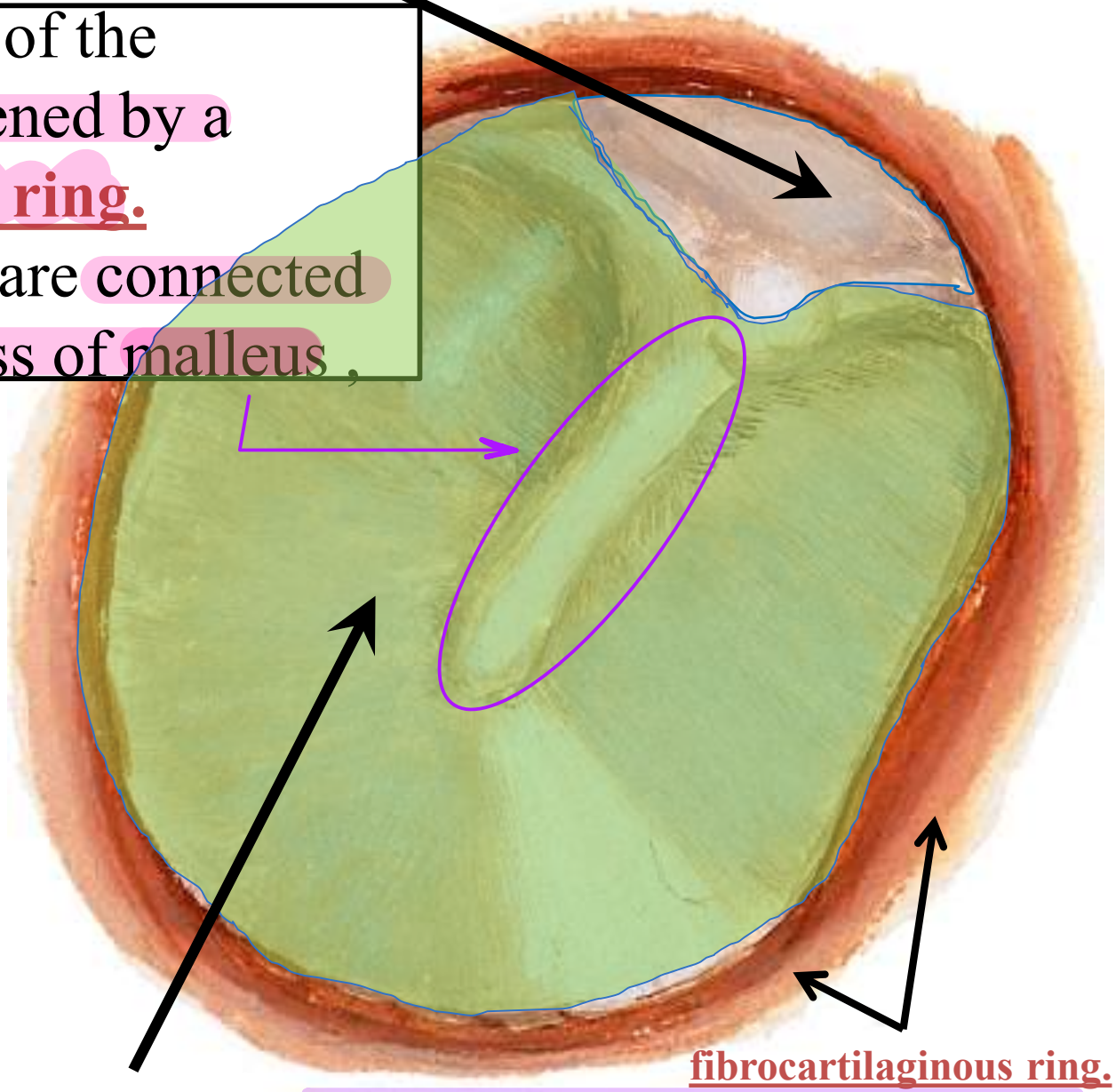


متوصلة بال naso-pharynx و عندها نفس linning تا ع ال respiratory system

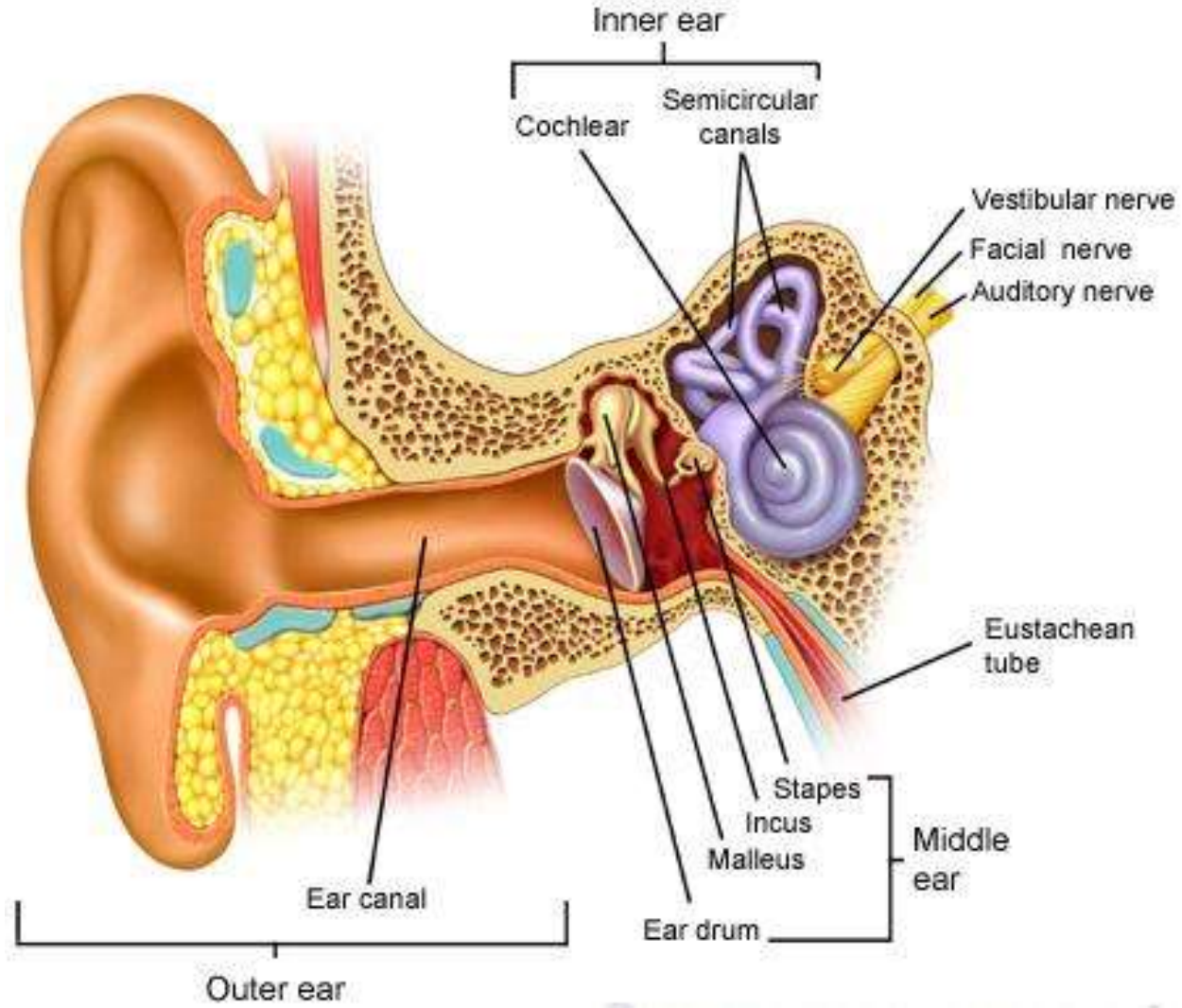
The circumference of the membrane is thickened by a **fibrocartilaginous ring.**
Two fibrous bands are connected to the lateral process of malleus ,

Parts

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

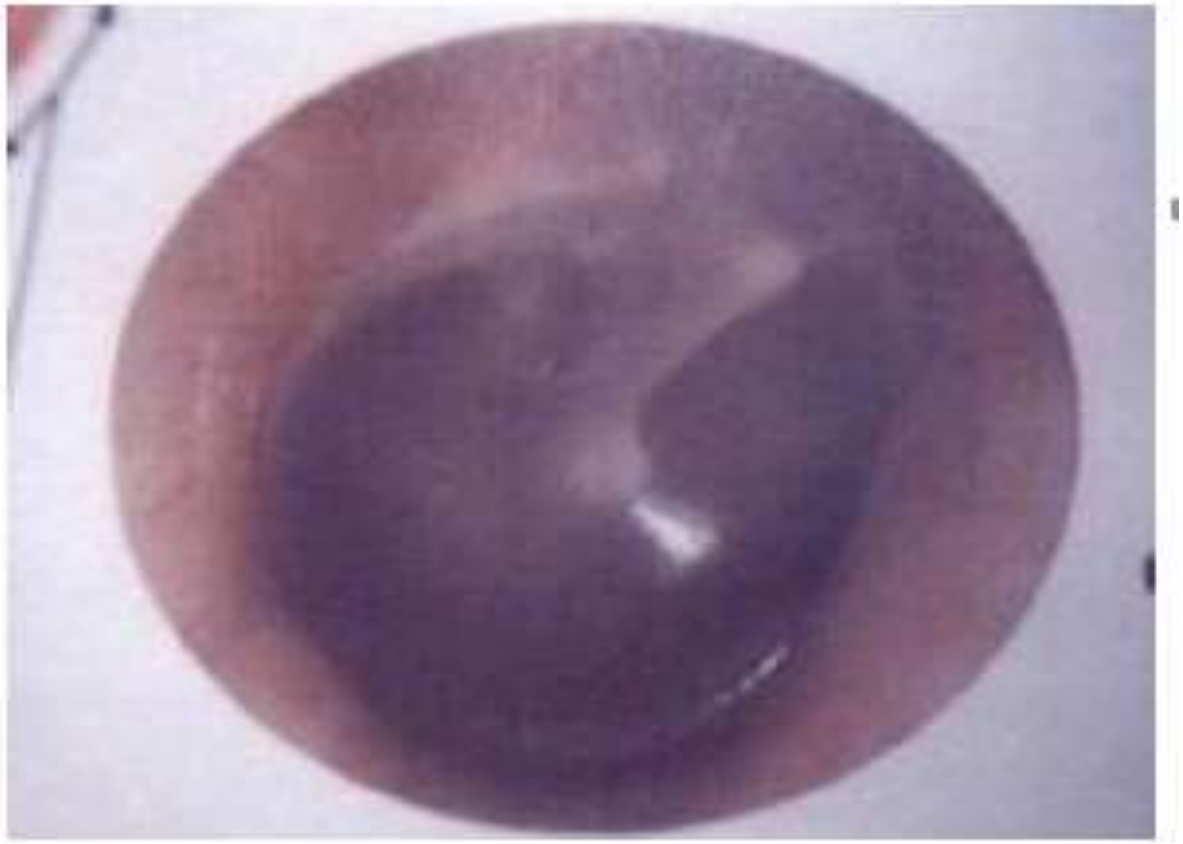


- The tympanic membrane is a thin, fibrous membrane that is pearly gray. The membrane is obliquely placed, facing downward, forward, and laterally. It is concave laterally, and at the depth of the concavity is a small depression, the (UMBO), produced by the tip of the handle of the malleus.

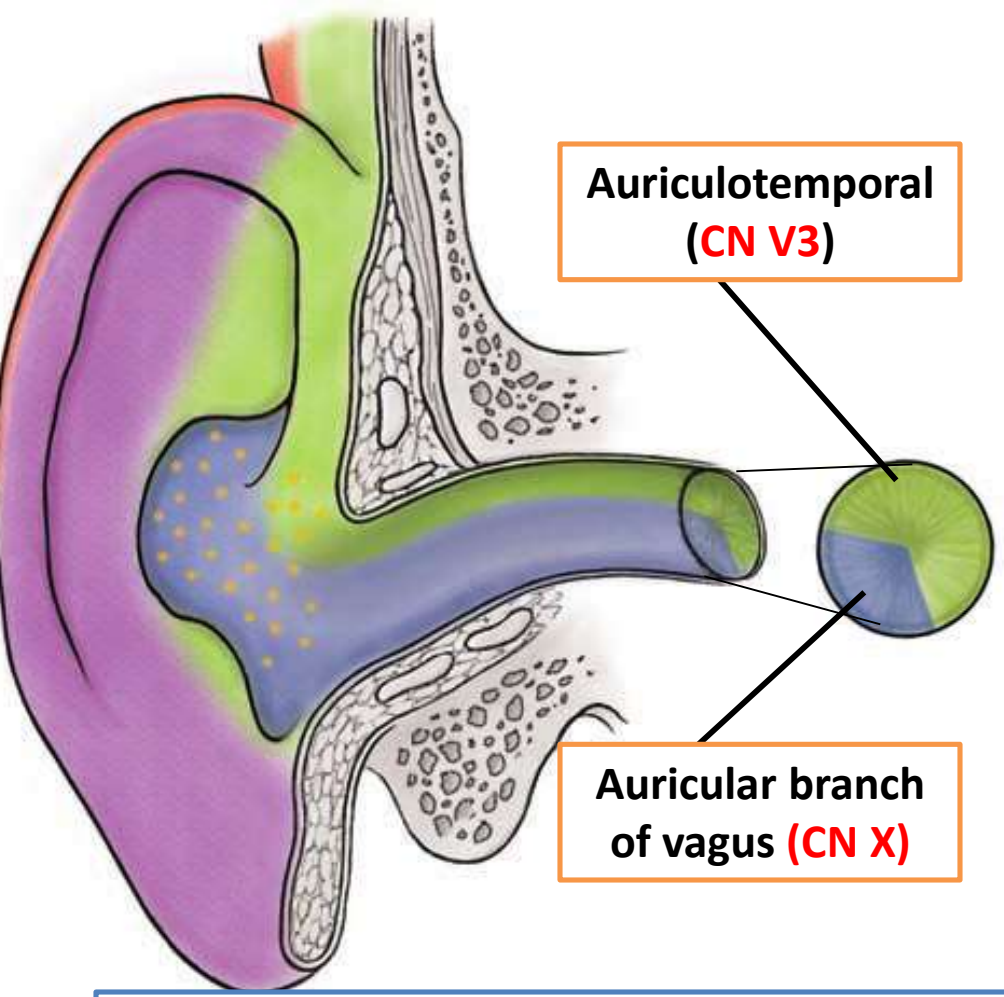


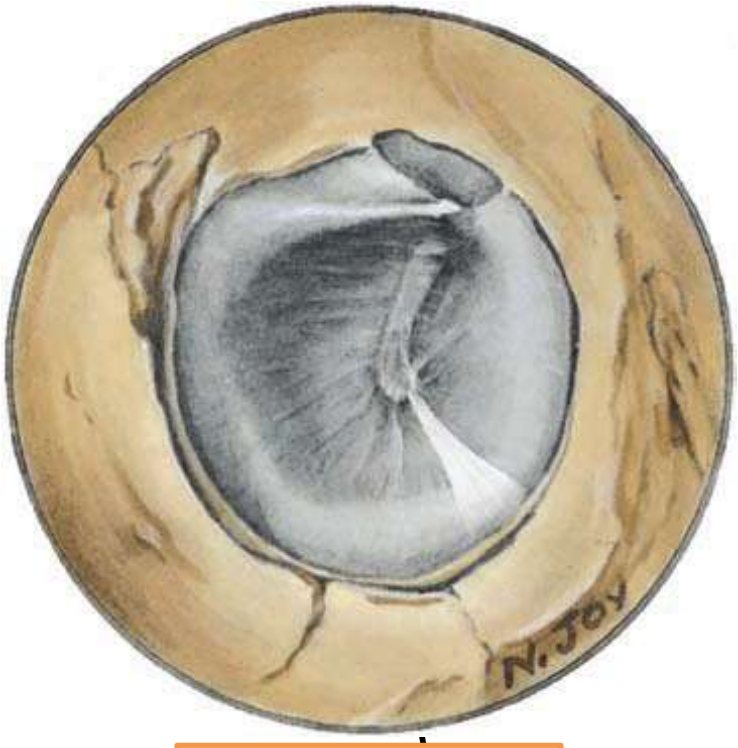
Examination of the tympanic membrane by Otoscope

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)



بكون anterior و اذا ما inferior كان موجود يعني tympanic membrane مش مقعر .. شو فائدة الكلام العبيط هاد؟ يعني بكون في accumulation of fluid or mucus





Tympanic nerve
(branch of CN IX)

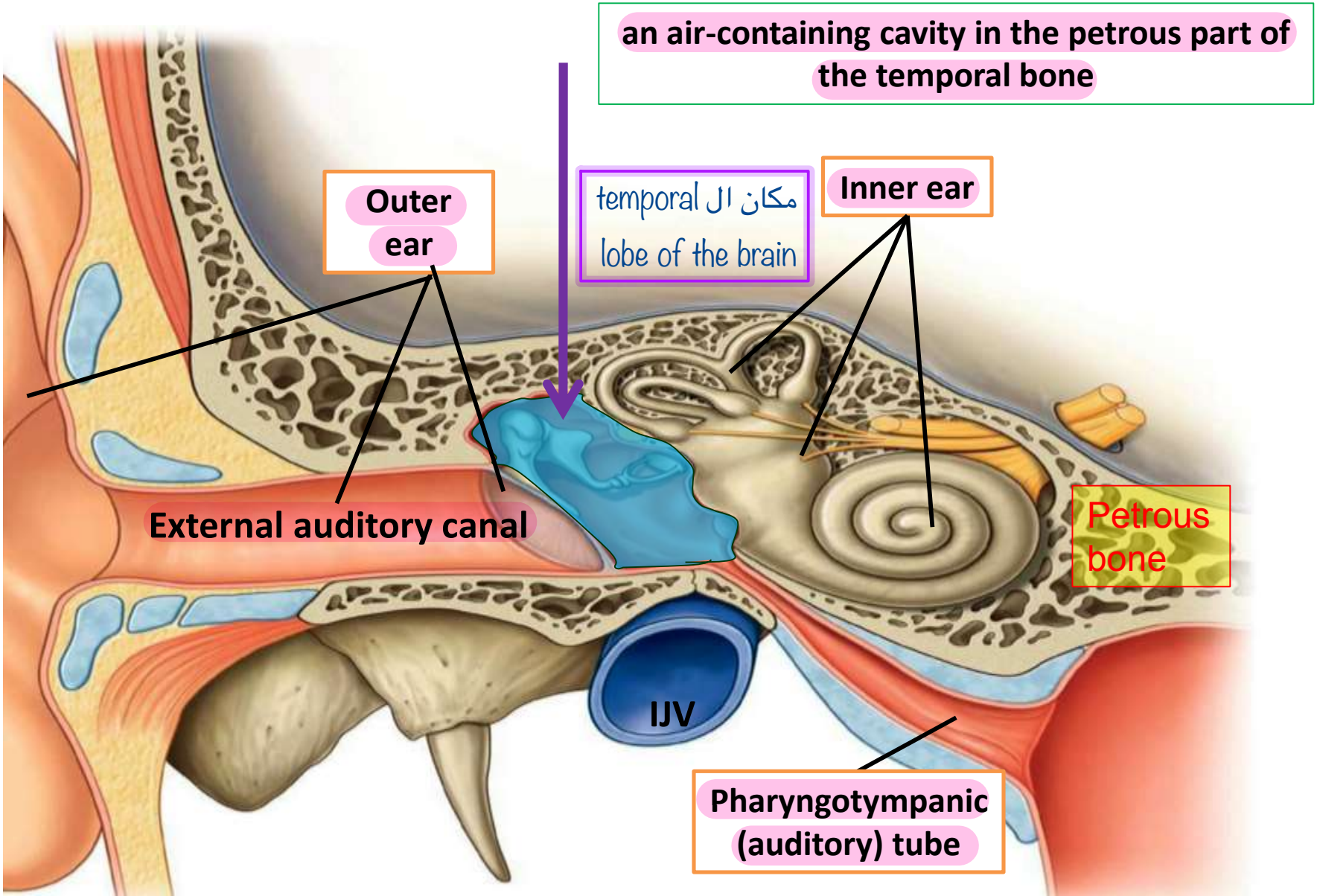
- Outer surface is supplied by auriculotemporal nerve and auricular branch of vagus nerve.
- Inner surface is supplied by the tympanic br. of glossopharyngeal nerve) via tympanic plexus.

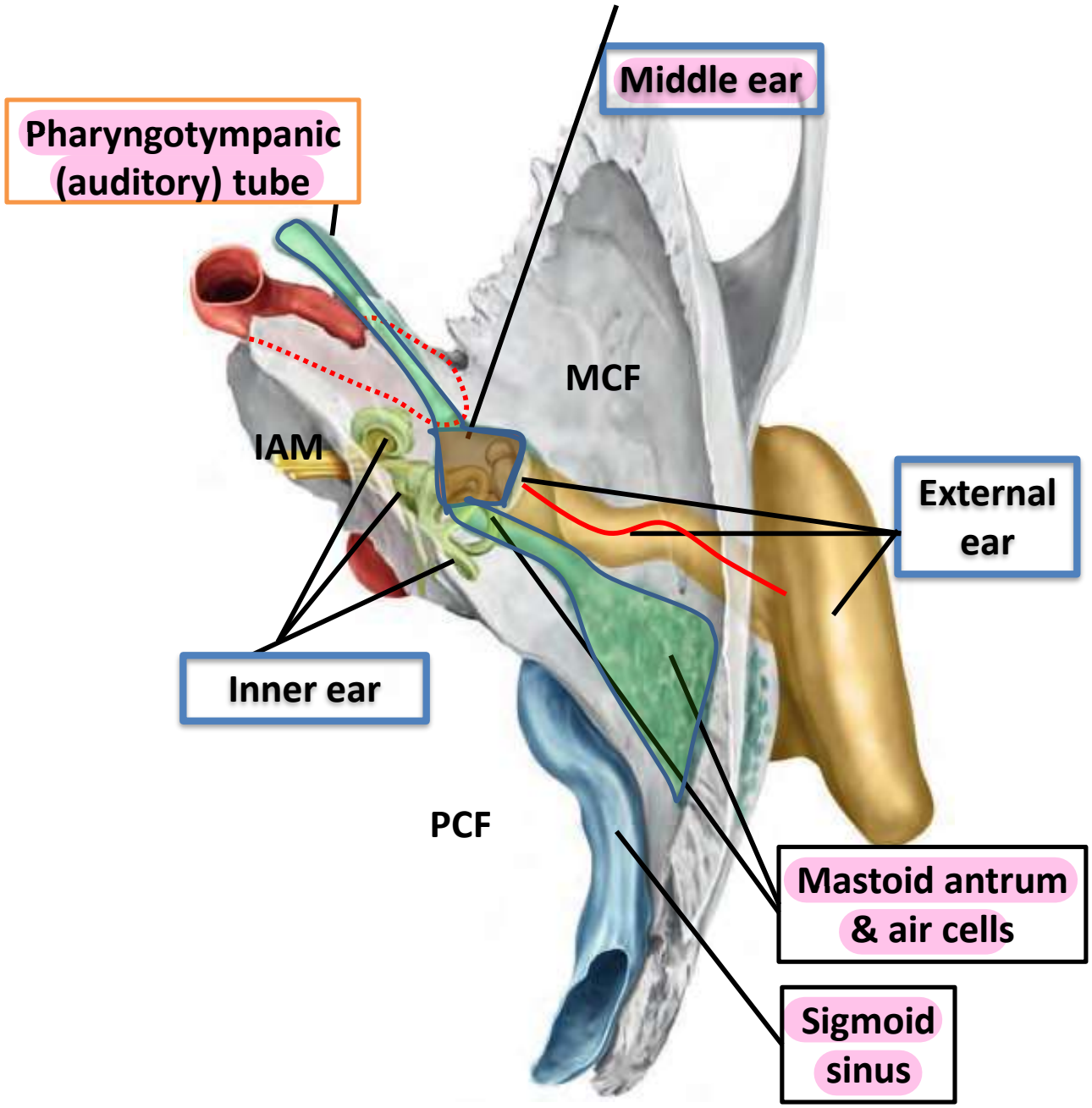
Part of respiratory system

The tympanic membrane is extremely sensitive to pain

لو عملت flush of fluid قوي لمريض راح تلاقيه بلش يسرخ او على الاقل ممكن يشتمك من الالم و ممكن يصيرله collapse و هاد بسبب ال vagus

MIDDLE EAR

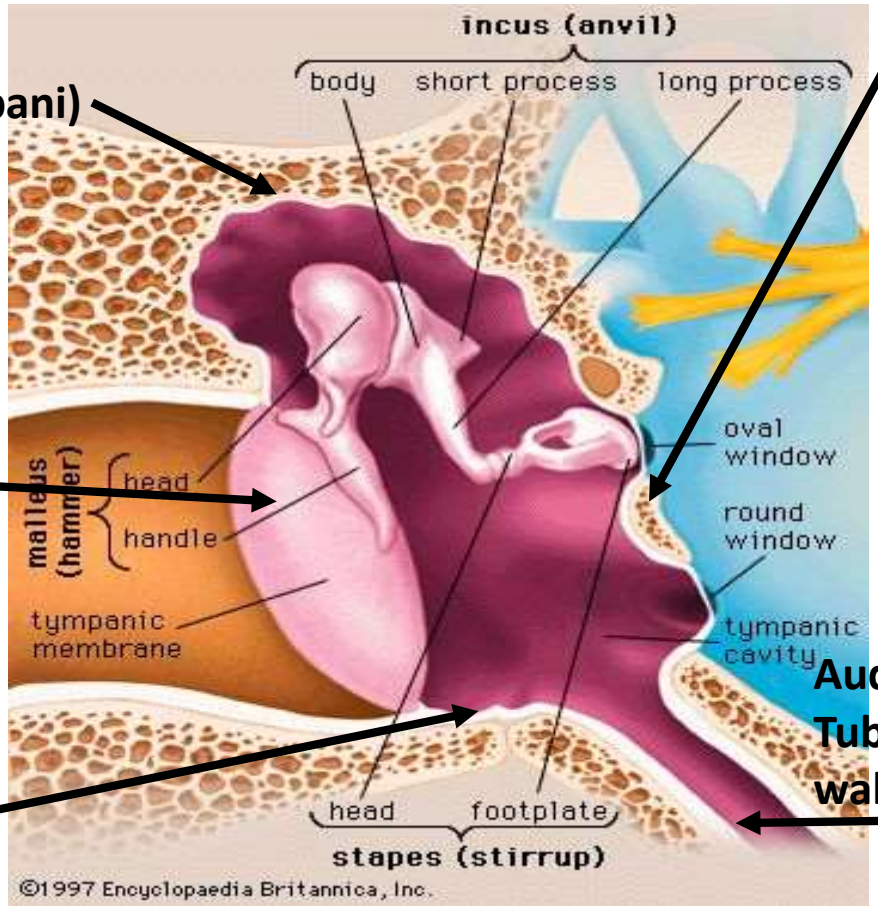

an air-containing cavity in the petrous part of the temporal bone
Outer ear
temporal مكان ال lobe of the brain
Inner ear
External auditory canal
Petrous bone
IJV
Pharyngotympanic (auditory) tube


Middle ear
Pharyngotympanic (auditory) tube
MCF
IAM
External ear
Inner ear
PCF
Mastoid antrum & air cells
Sigmoid sinus

Middle ear (walls and contents)

Medial wall

Roof (tegmen tympani)



Tympanic membrane (lateral wall)

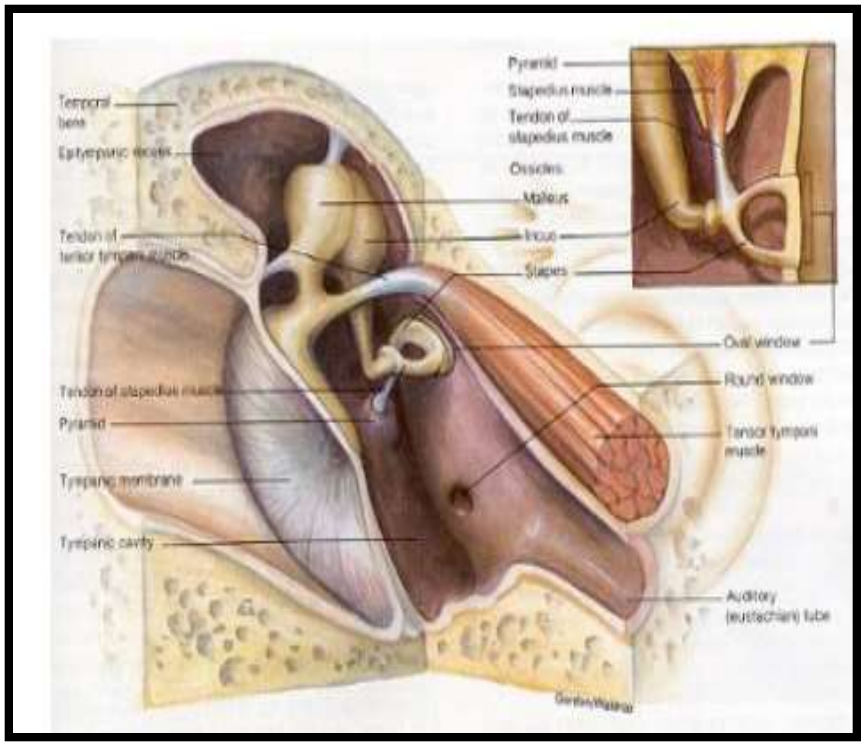
Auditory Tube(anterior wall)

Floor(jugular wall)

MIDDLE EAR

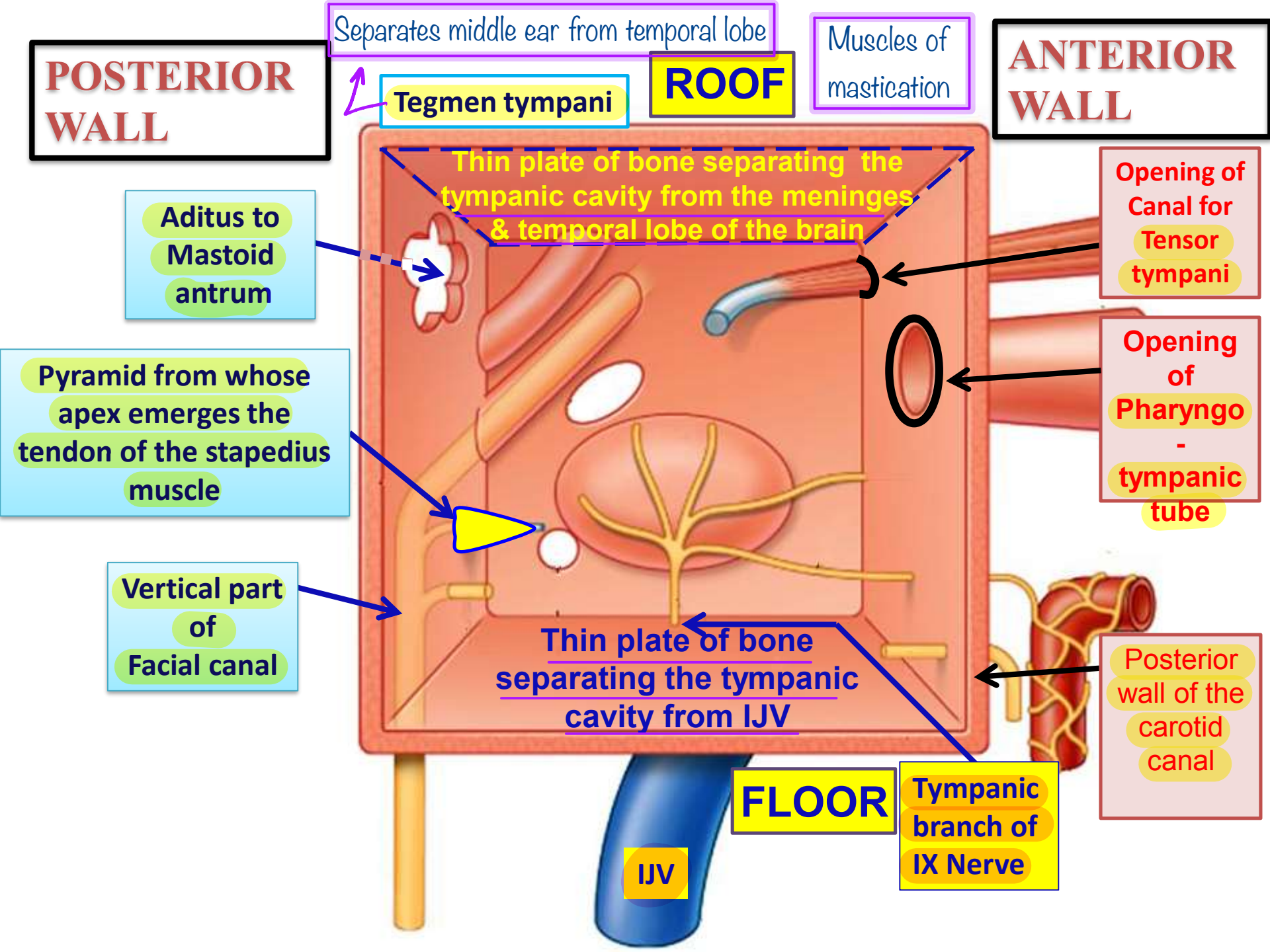
Walls

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

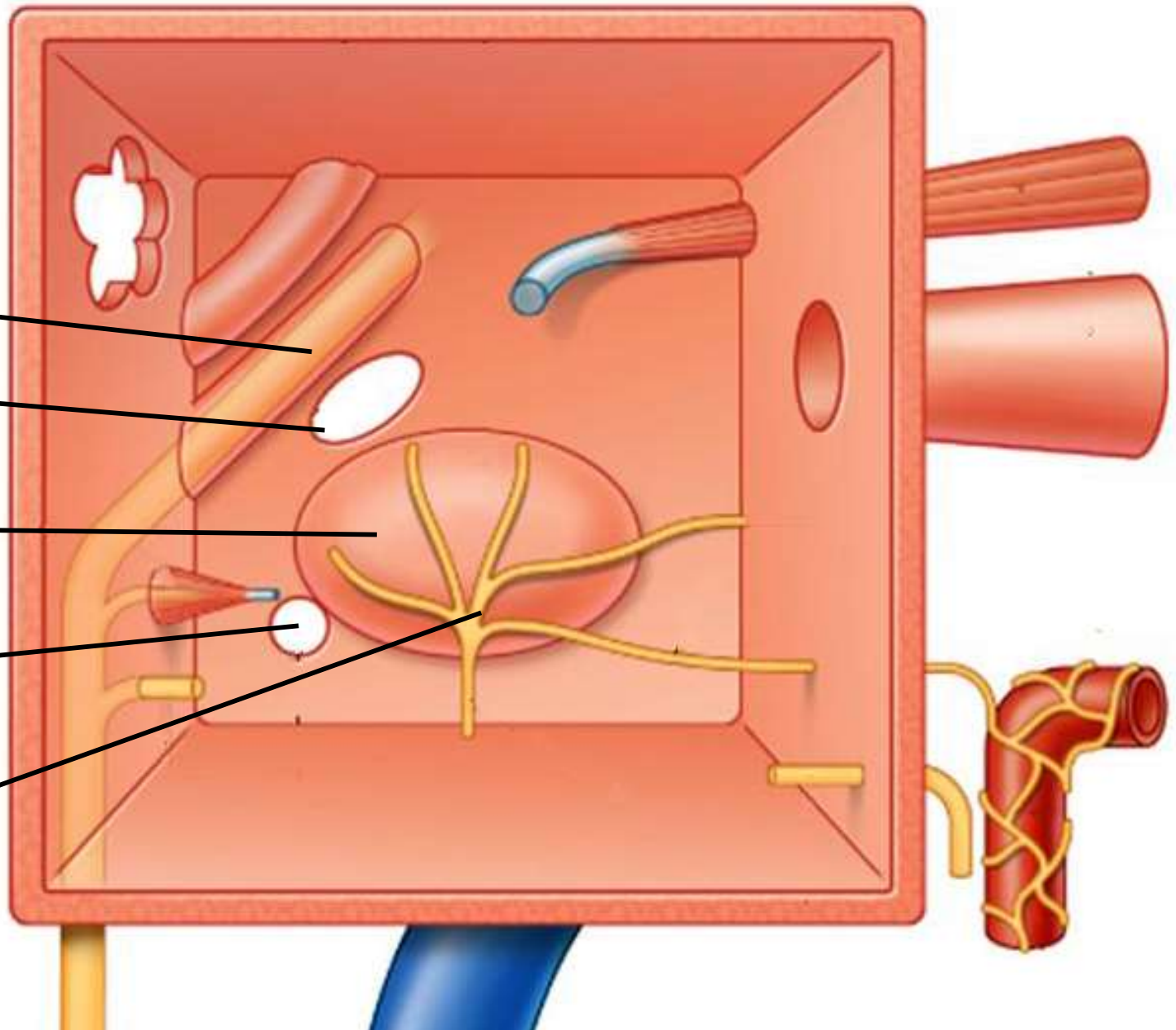


Contents

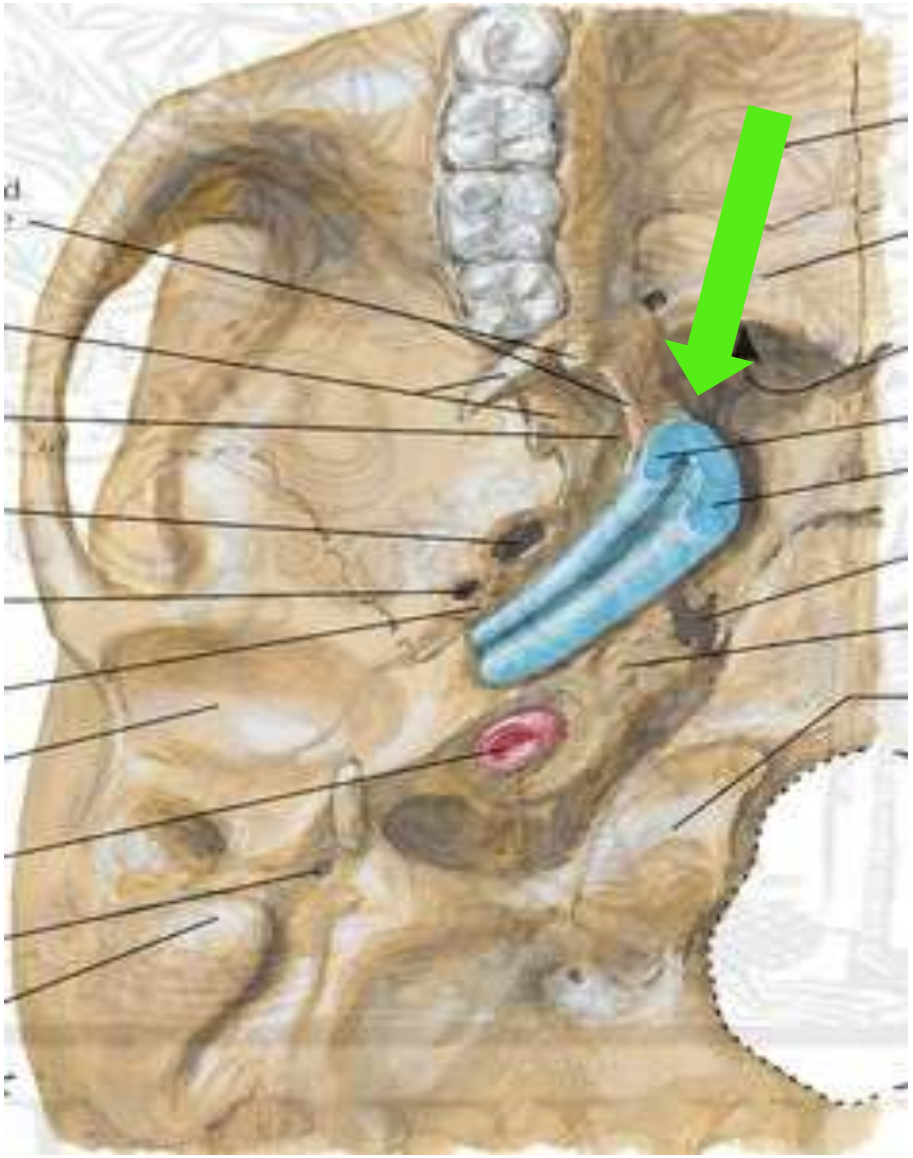
-Three Ossicles
-Two muscles

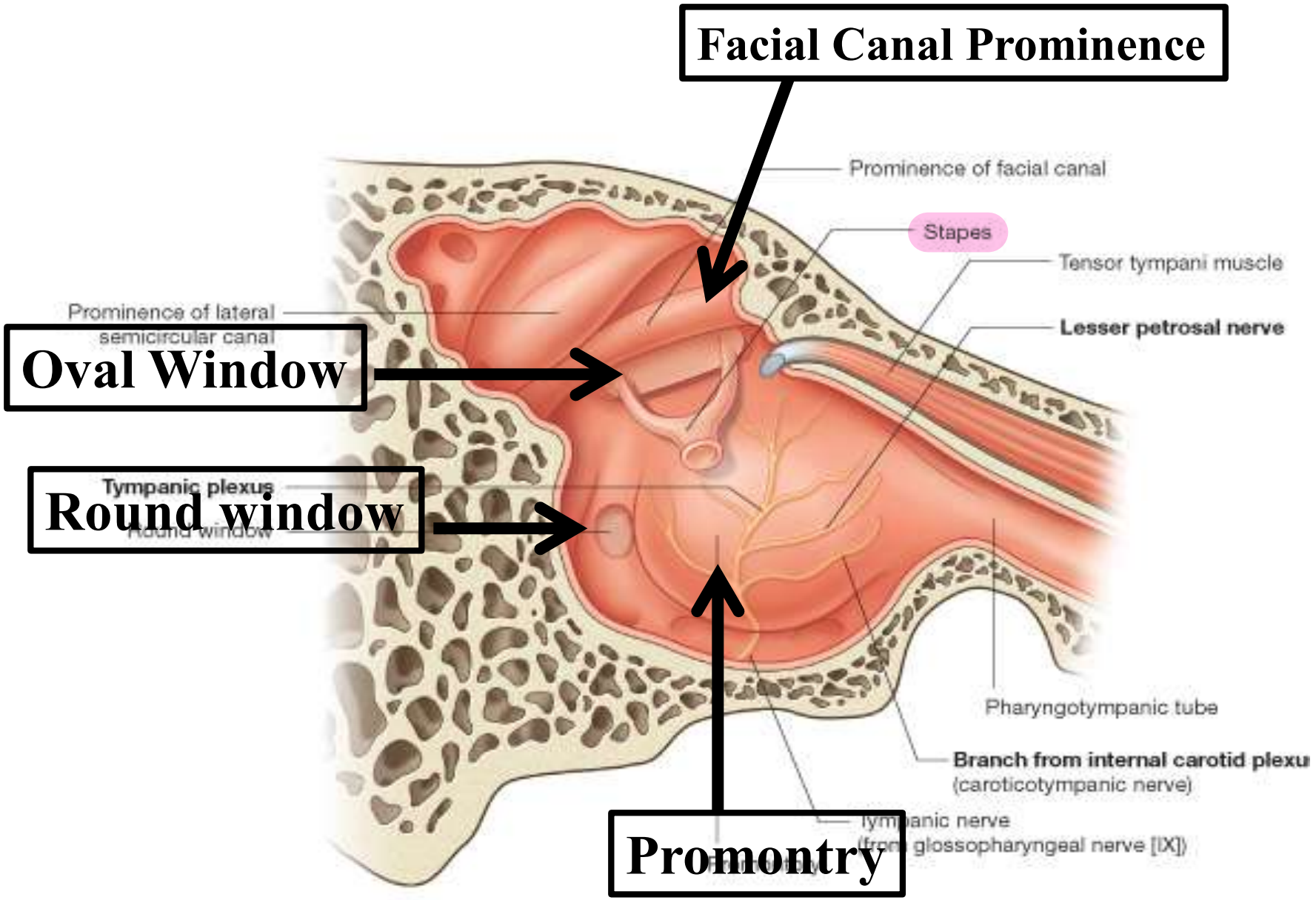

POSTERIOR WALL
Separates middle ear from temporal lobe
Tegmen tympani
ROOF
Muscles of mastication
ANTERIOR WALL
Thin plate of bone separating the tympanic cavity from the meninges & temporal lobe of the brain
Aditus to Mastoid antrum
Opening of Canal for Tensor tympani
Opening of Pharyngo - tympanic 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

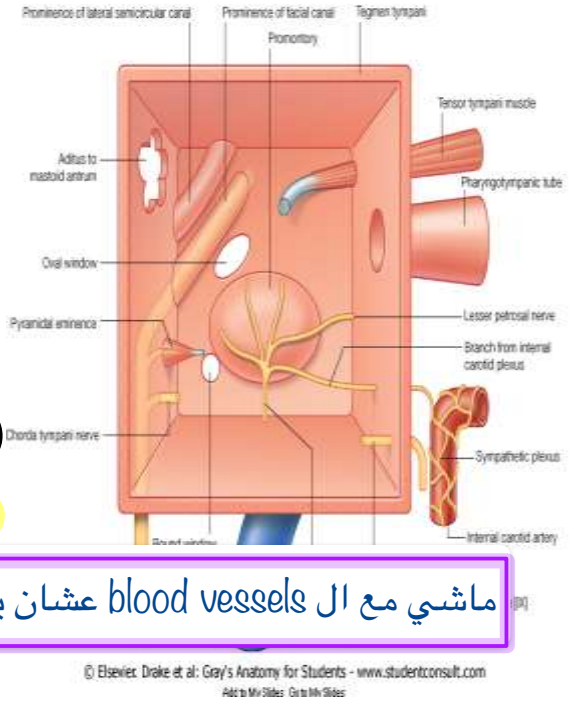
PHARYNGOTYMPANIC TUBE




Facial Canal Prominence
Prominence of facial canal
Stapes
Tensor tympani muscle
Prominence of lateral semicircular canal
Oval Window
Lesser petrosal nerve
Tympanic plexus
Round window
Round window
Pharyngotympanic tube
Branch from internal carotid plexu
(caroticotympanic nerve)
Promontry
© Elsevier. Drake et al: Gray's Anatomy for Students - www.studentconsult.com

Nerve supply of the middle ear

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

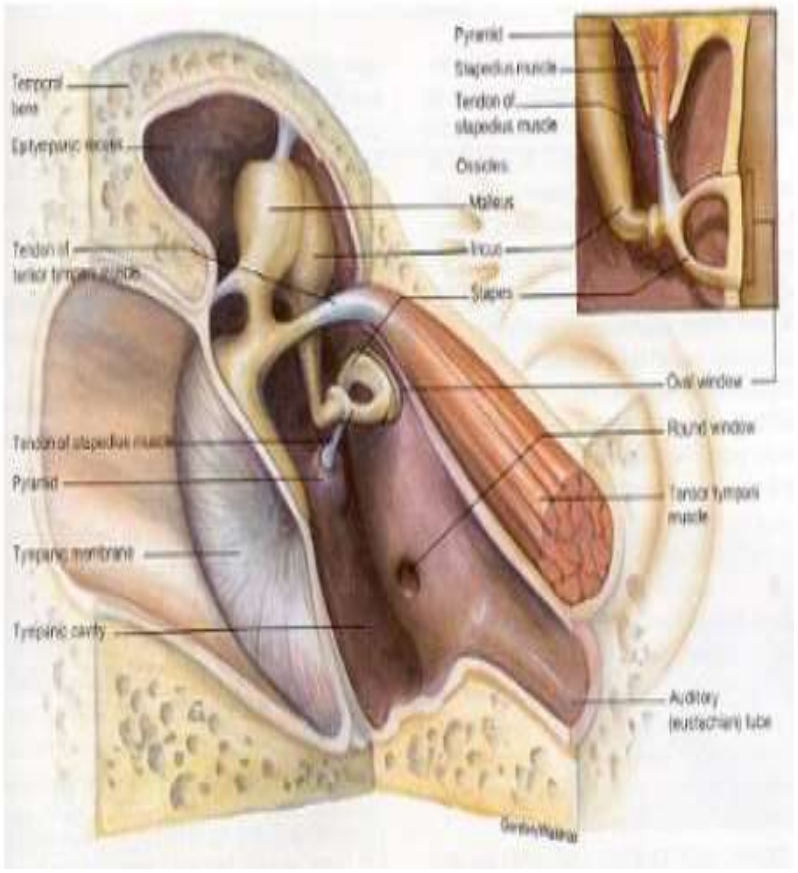


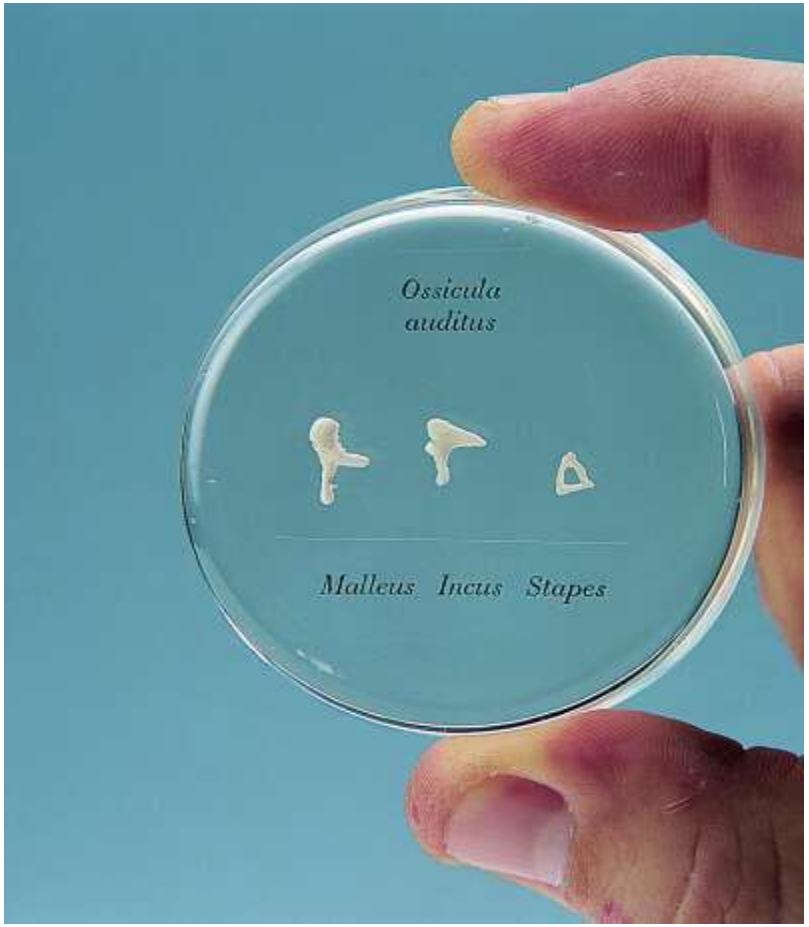
- **The following nerves share in the plexus:**
  1- **Tympanic nerve, br. From the glossopharyngeal nerve.**
  2- **Superior caroticotympanic (sympathetic)**
  3- **Inferior caroticotympanic. (sympathetic)**

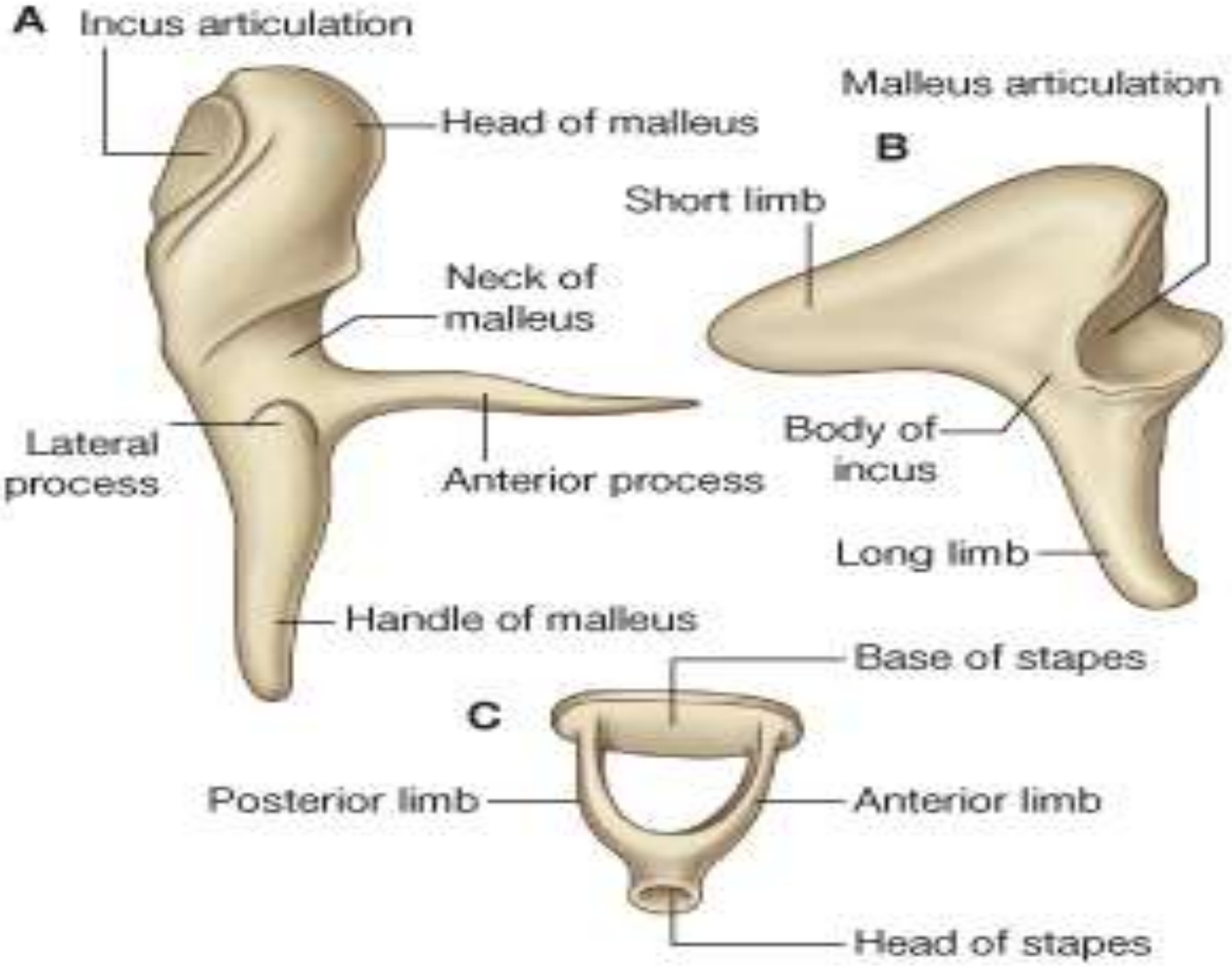
ماشي مع ال blood vessels عشان يعمل vasoconstriction وبحتاج يصير هيك عشان المكان مليان mucosa and secretions

- **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.)**

Three Ossicles

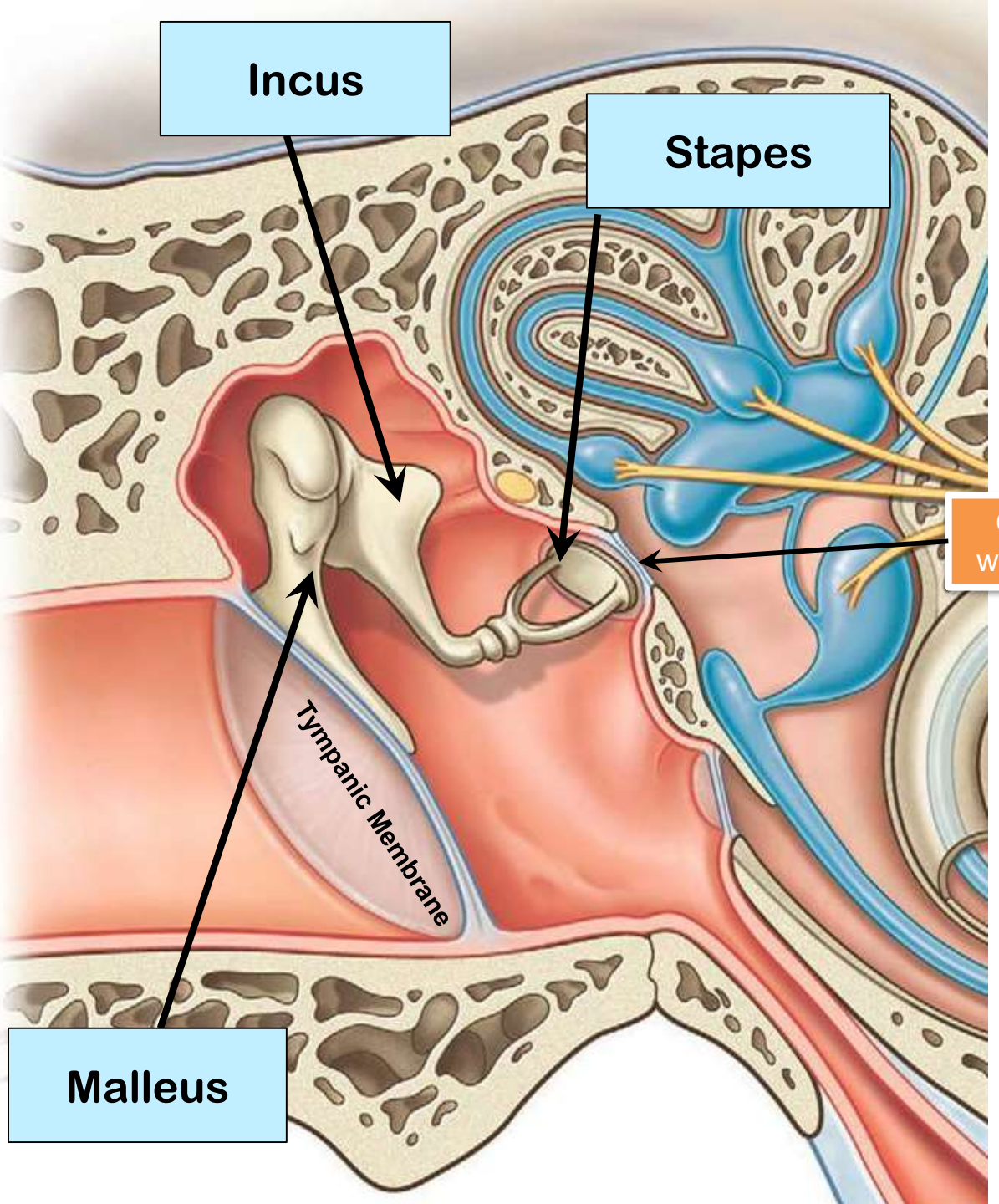


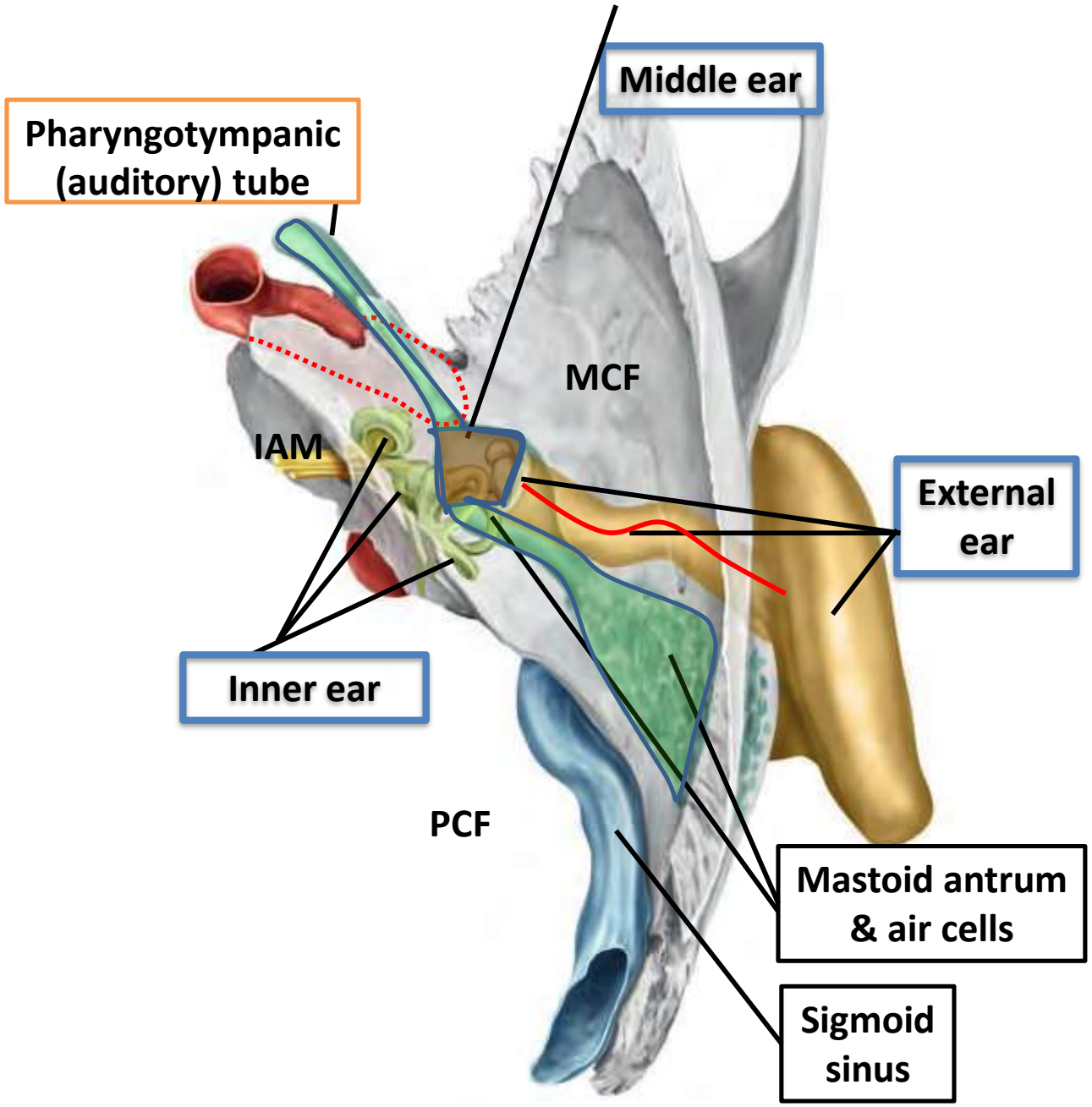



A
Incus articulation
Head of malleus
Neck of malleus
Lateral process
Anterior process
Handle of malleus
B
Malleus articulation
Short limb
Body of incus
Long limb
C
Base of stapes
Posterior limb
Anterior limb
Head of stapes

Ossicles

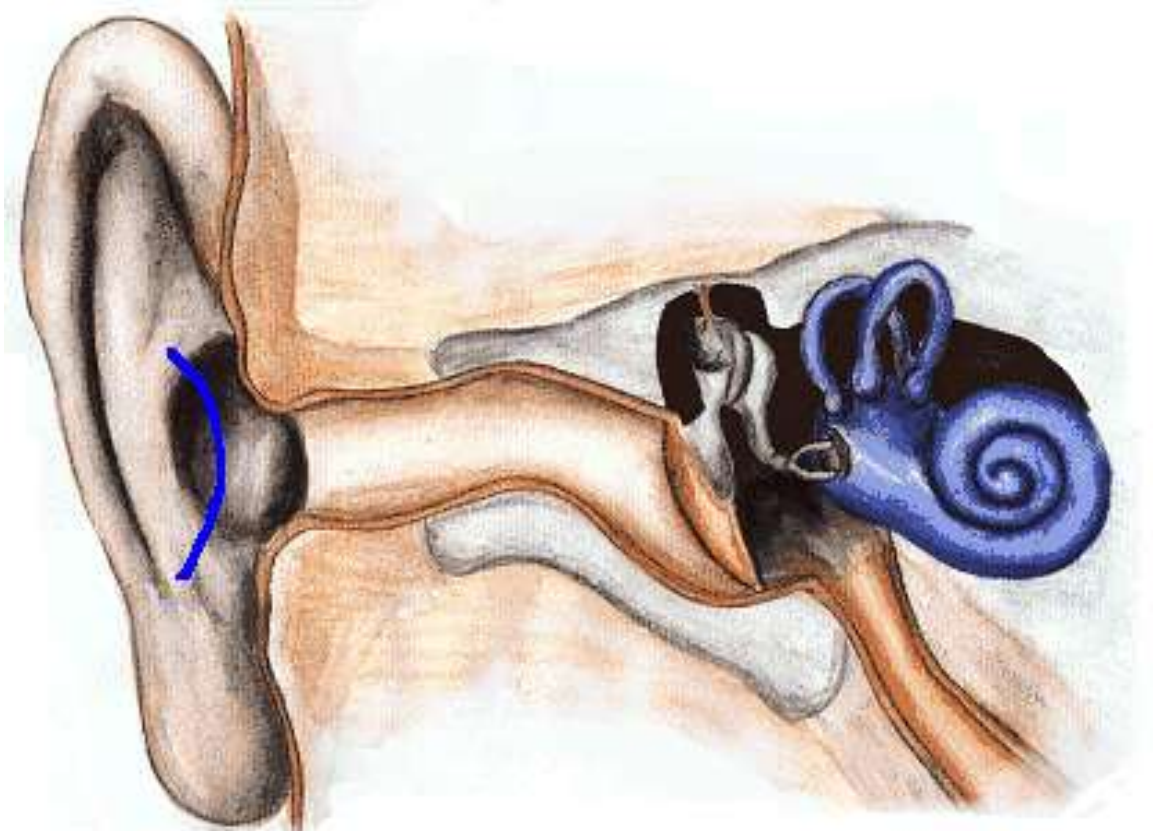
- **Malleus** is fixed to the inner surface of the tympanic membrane.
- **Incus** articulates with malleus and stapes.
- **Stapes** closes the oval window of inner ear.




Middle ear
Pharyngotympanic (auditory) tube
MCF
IAM
External ear
Inner ear
PCF
Mastoid antrum & air cells
Sigmoid sinus

Clinical notes

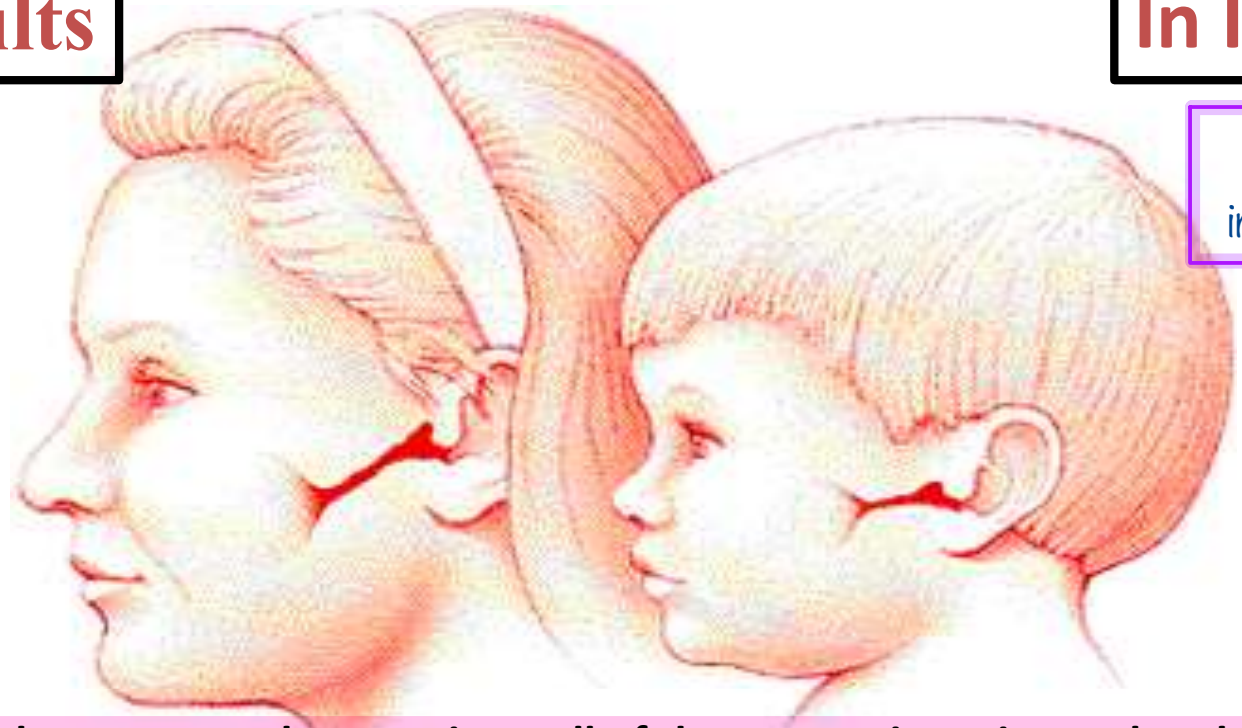
Sound waves causes vibration of the tympanic membrane. The ossicles transmit the vibrations to the oval window, which transmits them to the fluid column of the inner ear.



PHARYNGOTYMPANIC TUBE

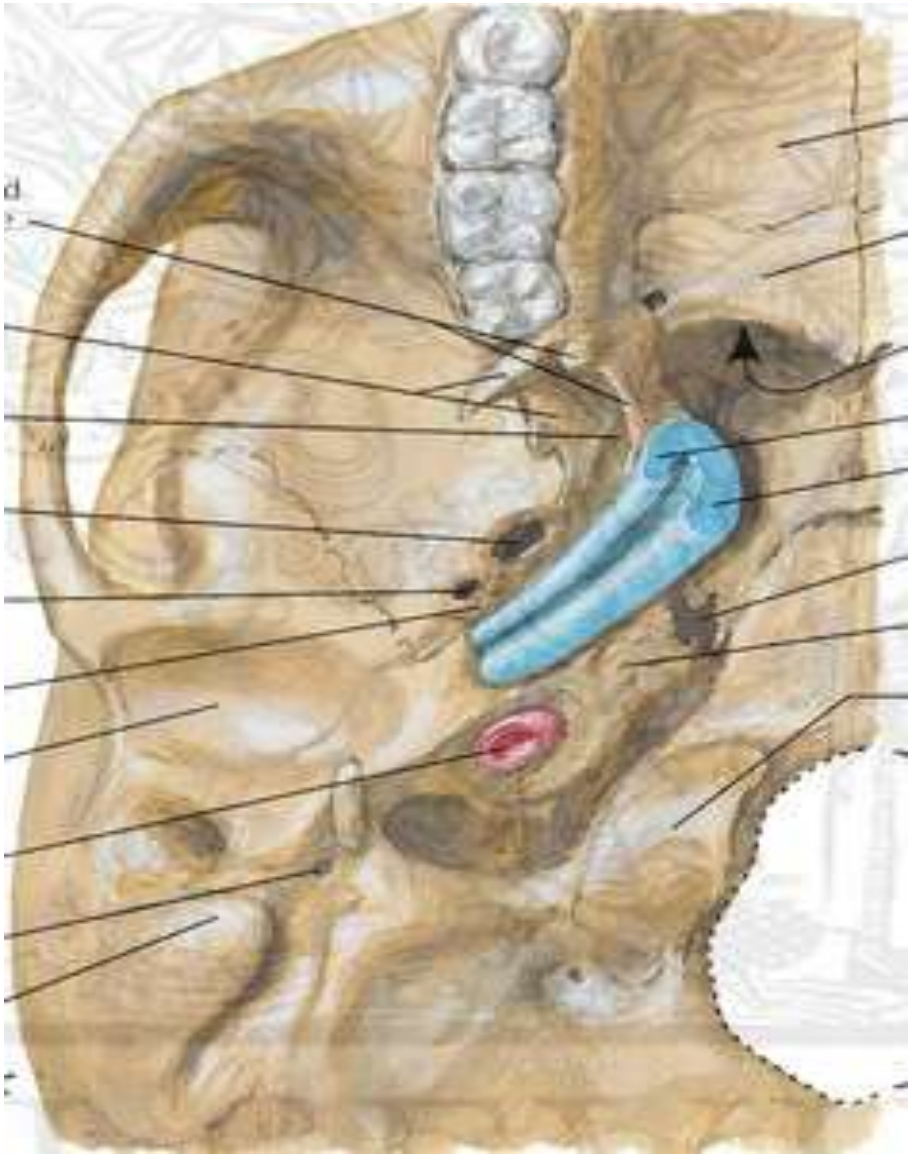
In Adults

In Infants



عشان هيك سهل
يصيرلهم infection

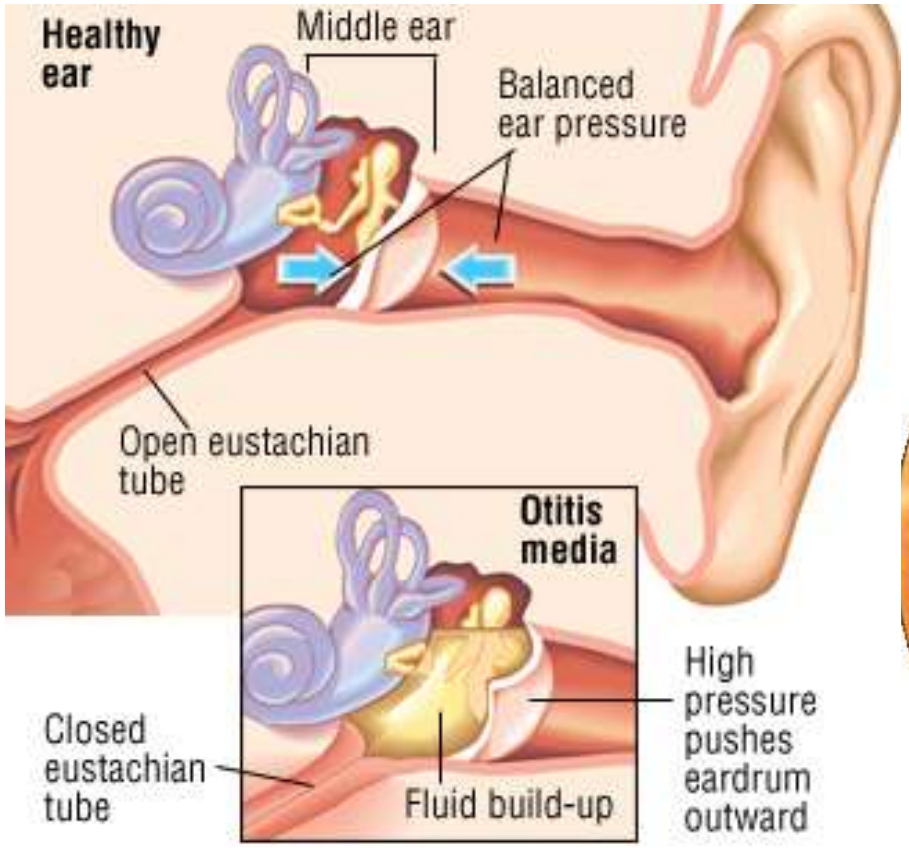
The auditory tube connects the anterior wall of the tympanic cavity to the pharynx.
Its posterior third is bony, and its anterior two thirds is cartilaginous.
It serves to equalize air pressures in the tympanic cavity and the pharynx.



CLINICAL NOTES

Otitis Media

زي هيك اشي الدكتور بفتحها بمشرط و بطلع كل الي جواها اذا انتركت ممكن تعمل perforation و لما يصيرلها healing راح تعمل fibrosis



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.

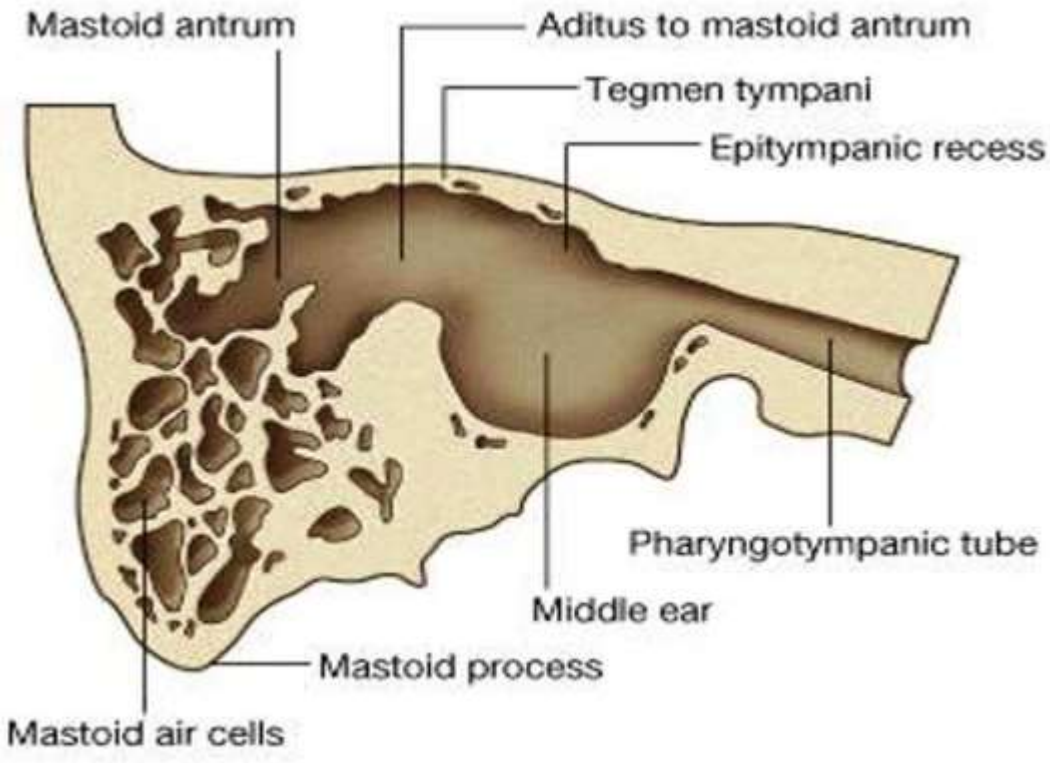
Mastoid Antrum

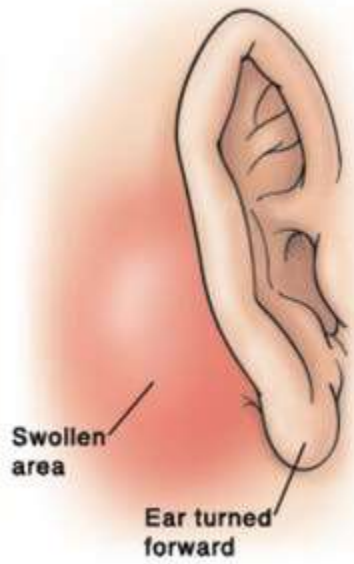
The mastoid antrum lies behind the middle ear. It communicates with the middle ear by the aditus

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.

لازم تحجزه بالمستشفى لانه ب اي لحظة يعمل abscess بال temporal lobe

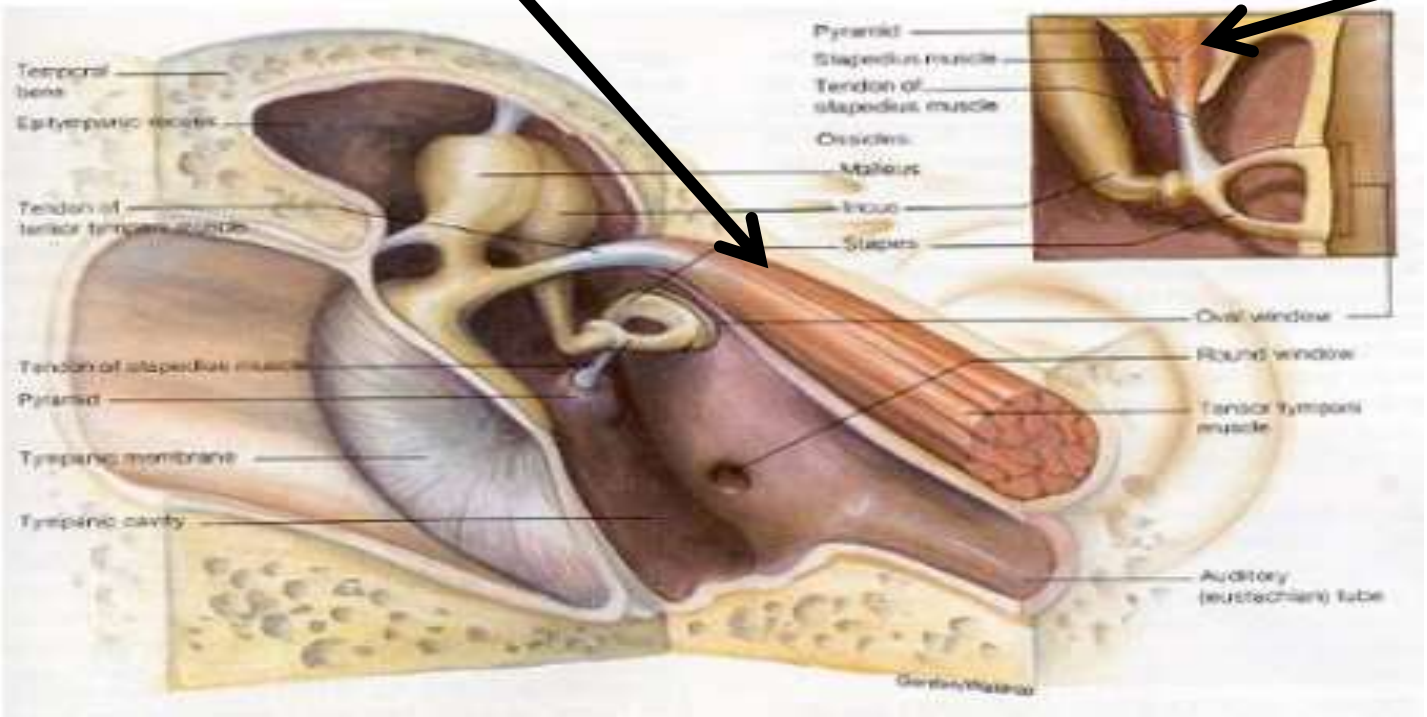


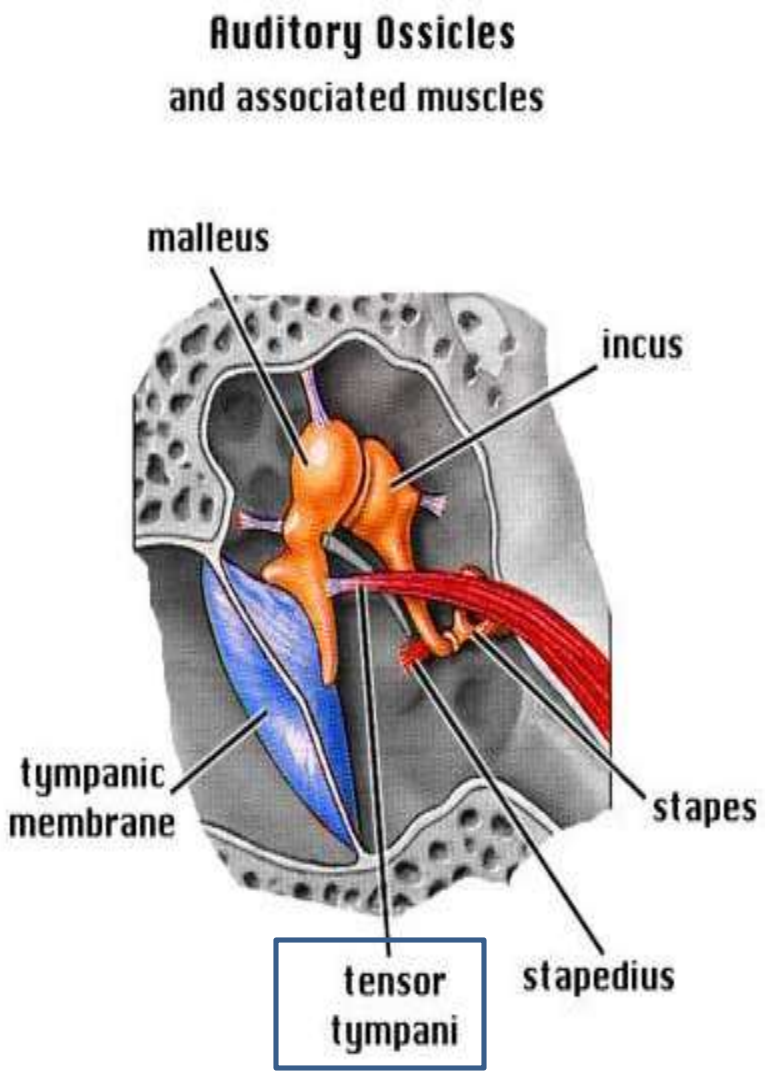


Muscles in the middle ear

Tensor Tympani M.

Stapedius M.



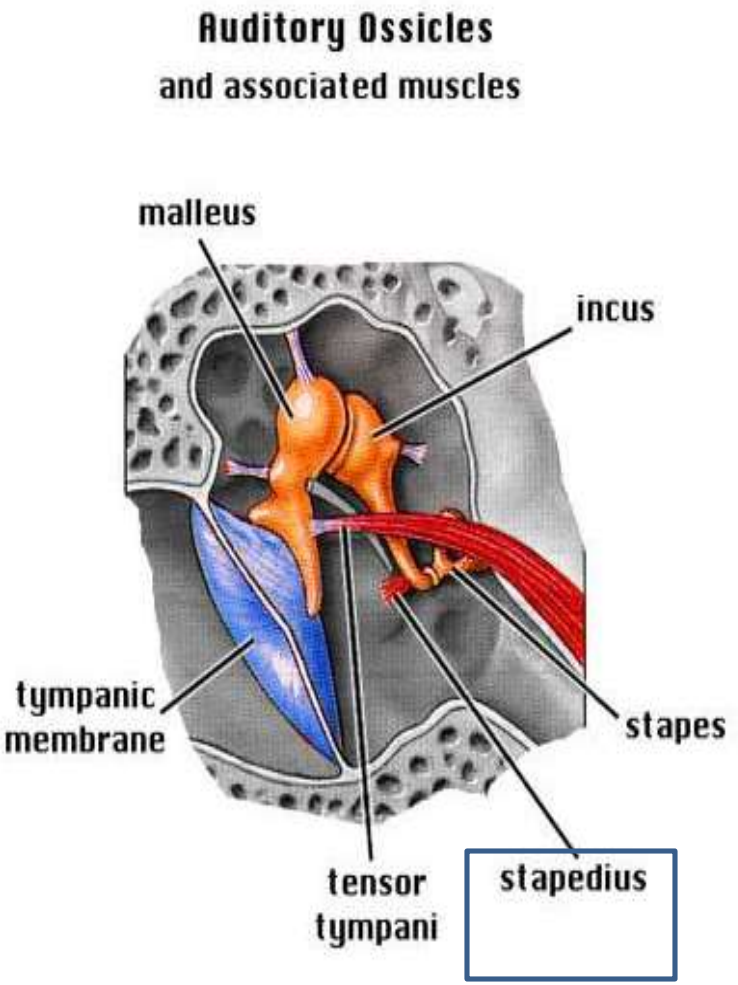


Tensor tympani Muscle

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).



Stapedius Muscle

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

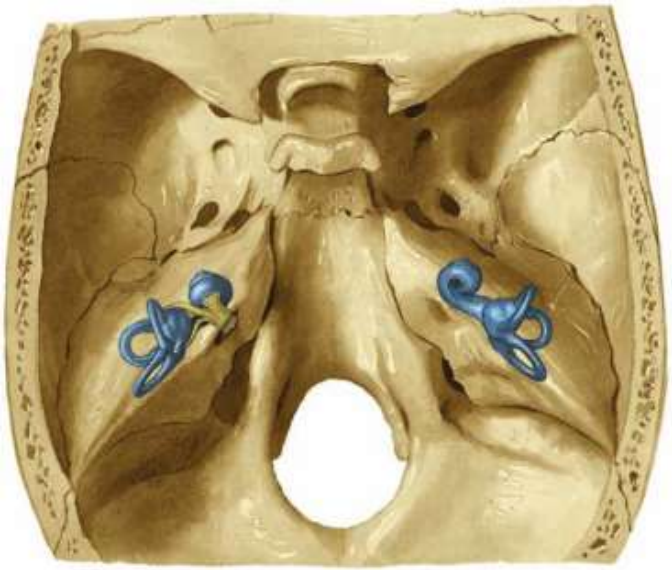
Arises from the pyramid

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.

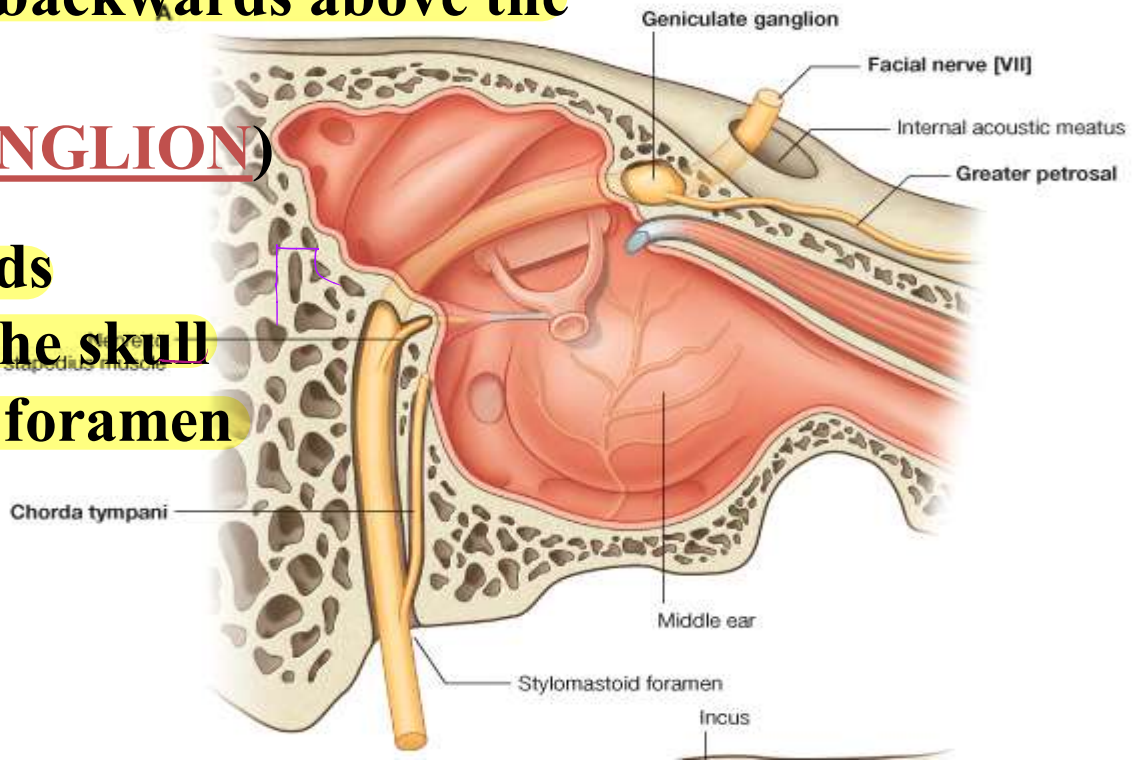
innervated by a branch of the ***Facial Nerve (CN VII)***.

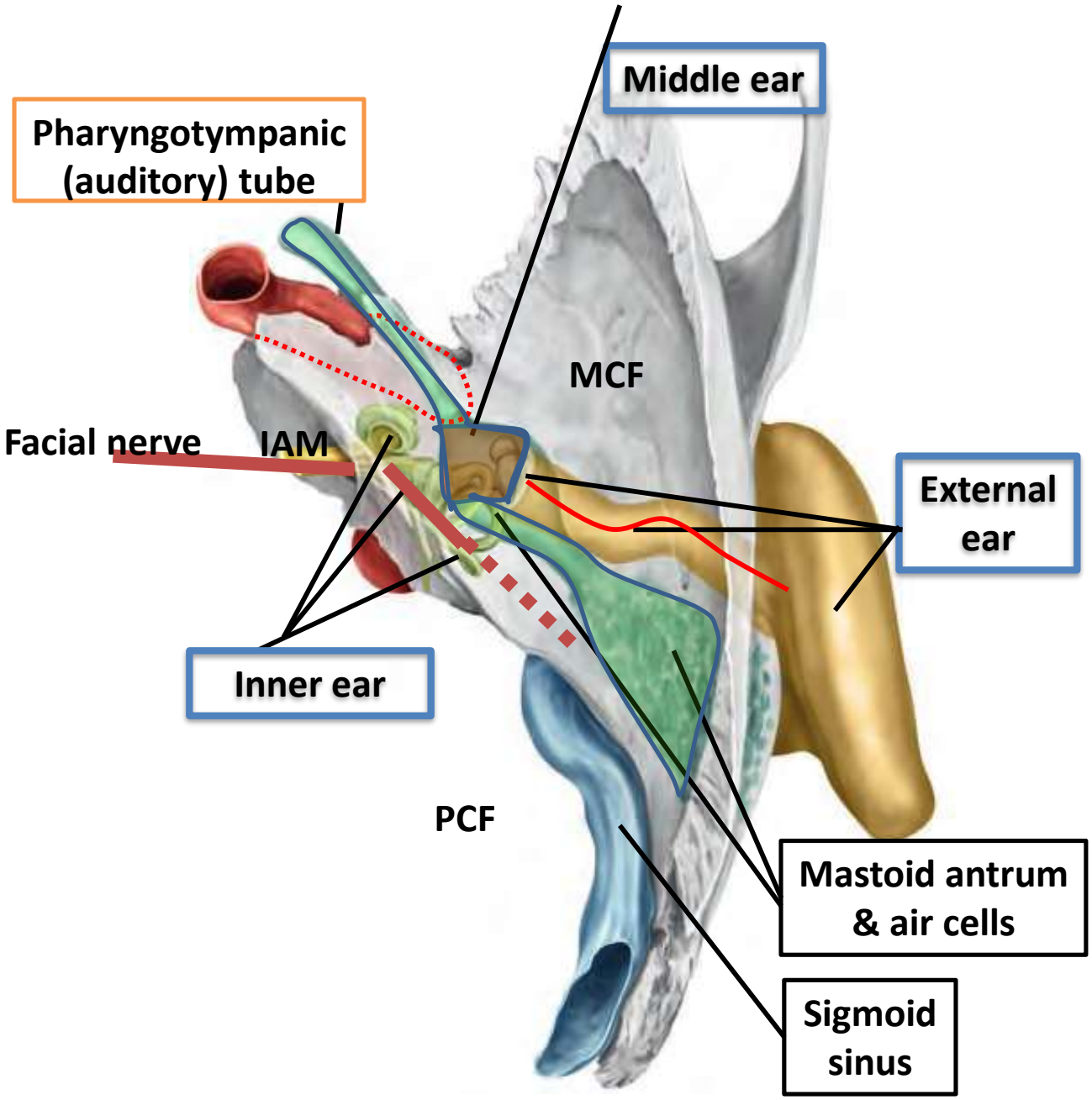
Facial Nerve

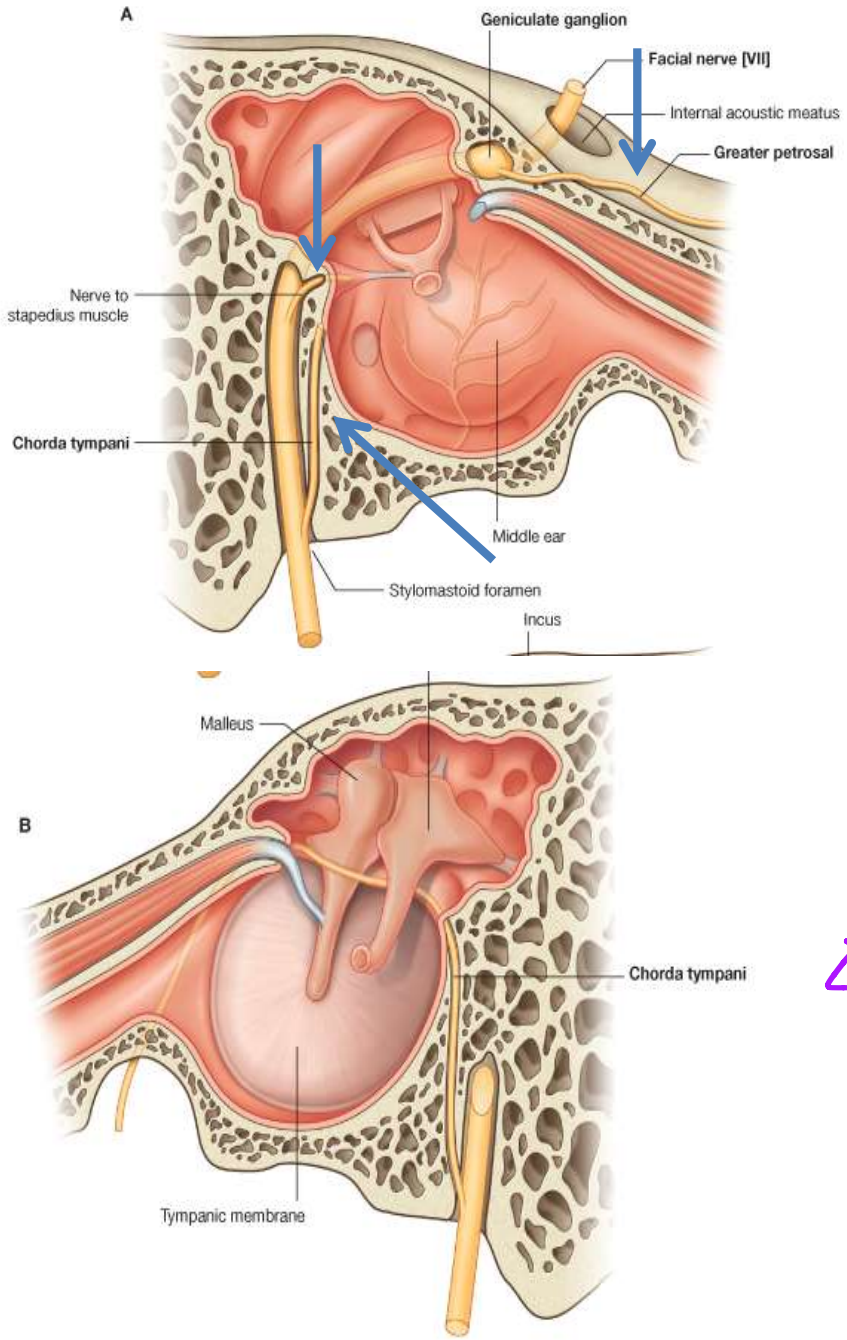


-It leaves the cranial cavity by passing through
the internal auditory meatus.
-It pierces the bottom of the meatus
-It passes laterally for short distance
- then bends sharply backwards above the promontry
(GENICULAR GANGLION)

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




Middle ear
Pharyngotympanic (auditory) tube
MCF
Facial nerve
IAM
External ear
Inner ear
PCF
Mastoid antrum & air cells
Sigmoid sinus



Branches:

1- Greater Petrosal nerve

Out of the geniculate ganglion

↳ Supplies pytrego palatine ganglia

2-Nerve to Stapedius M

3-Chorda Tympani

↳ Supplies anterior 2/3 of the tongue

After leaving the stylomastoid foramen

Supplies occipital belly of occipitofrontalis muscle

1- Posterior auricular N.

2- Digastric Br. → Posterior belly of digastric

3- Stylohyoid Br.

4- five terminal Brs in the face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Thank you