

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

GROSS ANATOMY OF

E

A

R

E

A

R

By

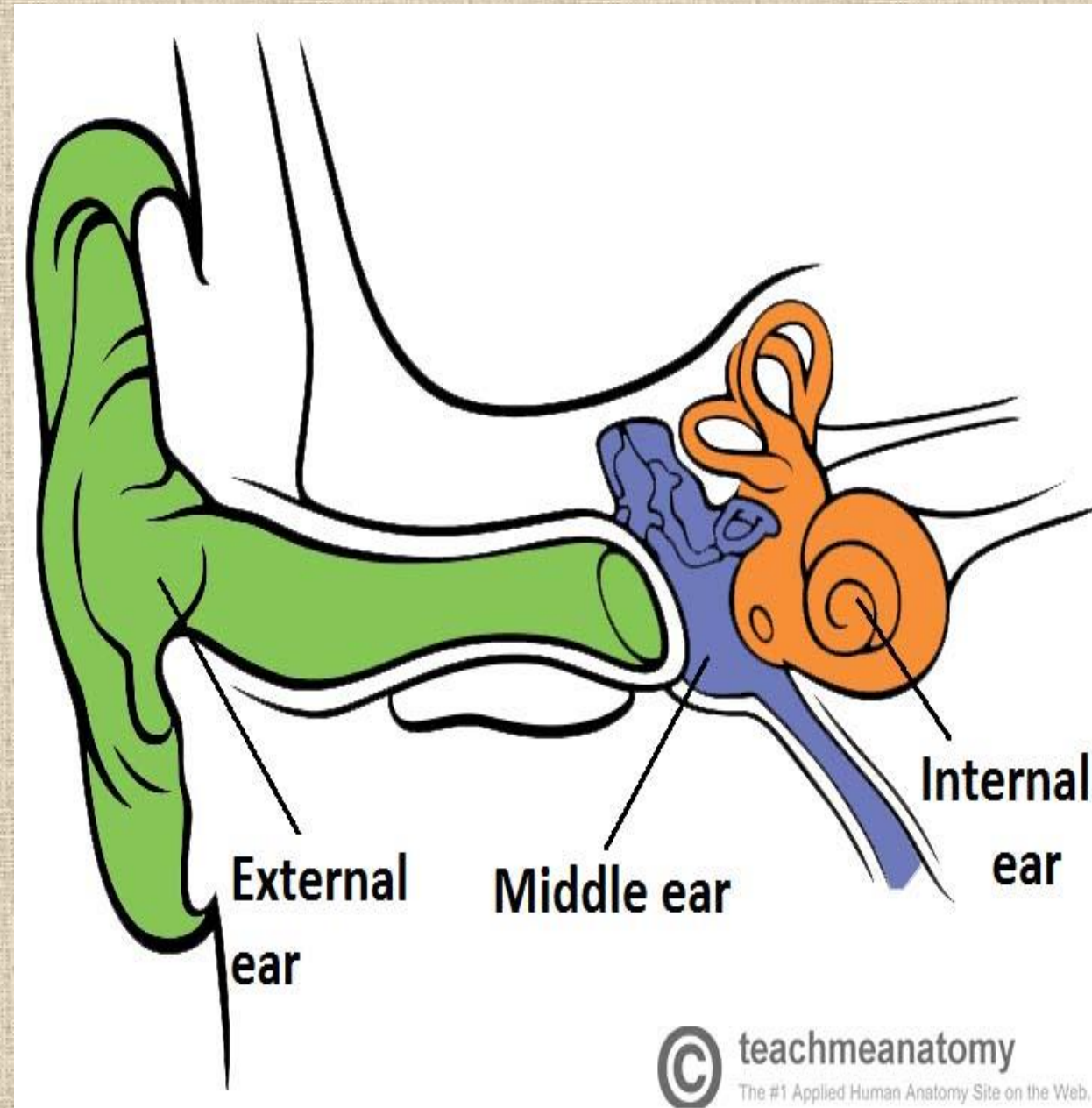
DR. MAHVISH JAVED

Assistant Professor, Department of Anatomy

Khyber Girls Medical College, Peshawar

THE EXTERNAL EAR

- The ear can be divided into three parts; external, middle and inner. This article will focus on the anatomy of the **external ear** – its structure, neurovascular supply and clinical correlations.
- The external ear can be divided functionally and structurally into **two parts**; the auricle (or pinna), and the external acoustic meatus – which ends at the tympanic membrane.



AURICLE

- The **auricle** is a paired structure found on either side of the head. It functions to capture and direct sound waves towards the external acoustic meatus.
- It is a mostly cartilaginous structure, with the **lobule** being the only part not supported by cartilage. The cartilaginous part of the auricle forms an outer curvature, known as the **helix**. A second innermost curvature runs in parallel with the helix – the antihelix. The antihelix divides into two parts; the inferior anterior crus, and the superior posterior crus.
- In the middle of the auricle is a hollow depression, called the **concha**. It continues into the skull as the external acoustic meatus. The concha acts to direct sound into the external acoustic meatus. Immediately anterior to the beginning of the external acoustic meatus is an elevation of cartilaginous tissue – the tragus. Opposite the tragus is the antitragus.

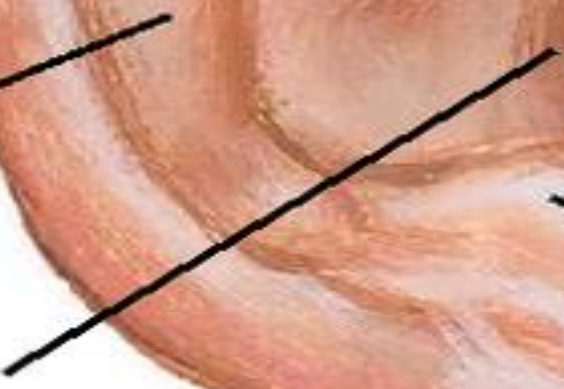
Helix



Antihelix



Concha



Lobule



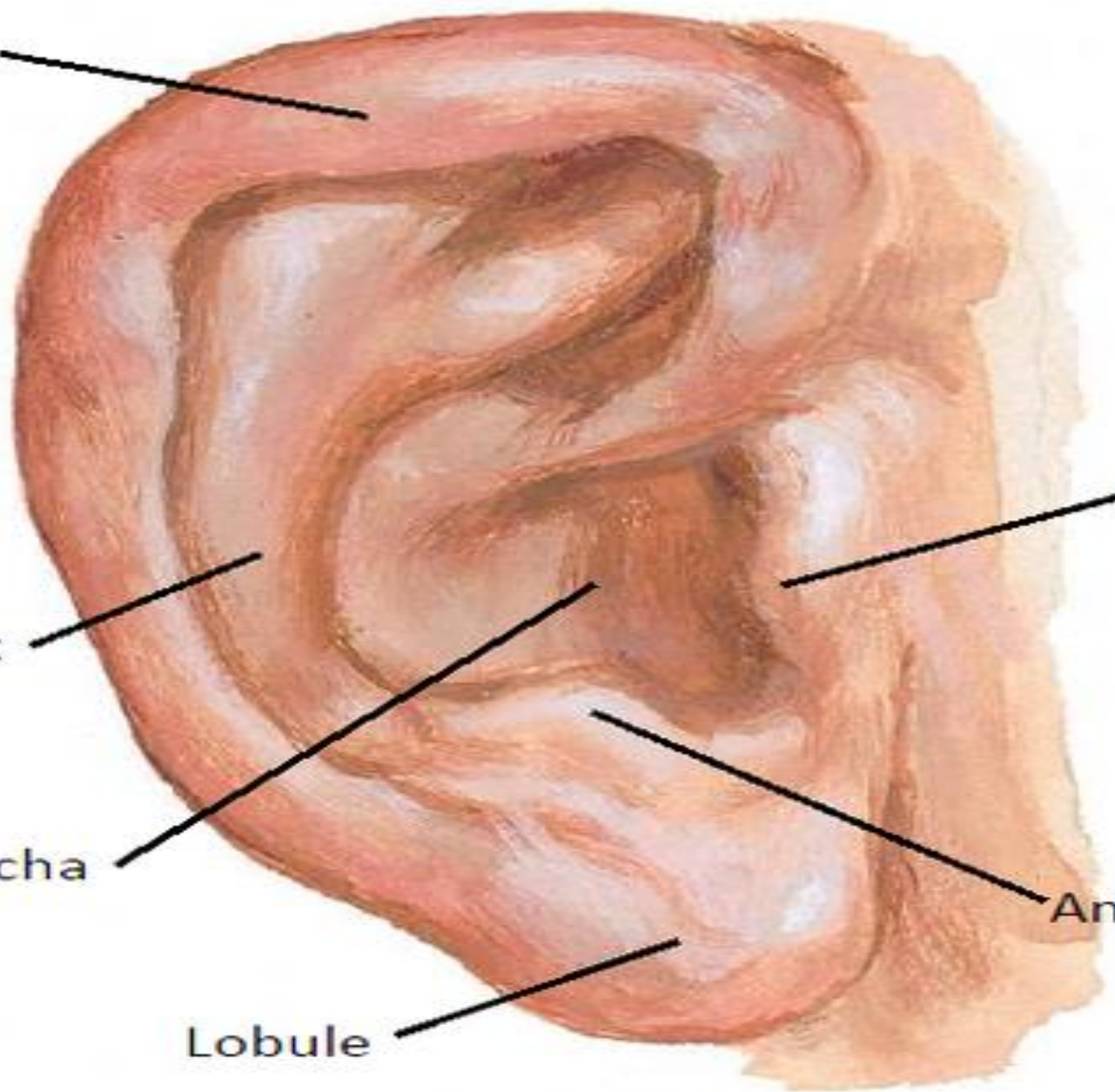
Tragus



Antitragus



93N5



- *Opposite the tragus, and above the fleshy **lobule**, is another elevation (the **antitragus**)*
- *A smaller curved rim, parallel and anterior to the helix is the **antihelix***
- *The antihelix divides above into **2 legs or crura***
- *In between these crura is a depression called the **triangular fossa***
- *A curved depression lies between the **helix** and **antihelix** and it is called the **scapha/scaphoid fossa***

Muscles

Include;

- ✓ *Intrinsic muscles*
- ✓ *Extrinsic muscle*

intrinsic muscles

- *pass between the cartilaginous parts of the auricle and may change the shape of the auricle*

They include:

- *Helicis major*
- *Helicis minor*
- *Tragicus*
- *Antitragicus*
- *Transverse muscle*
- *Oblique muscle*

extrinsic muscles

- *pass from the scalp or skull to the auricle and may also play a role in positioning of the auricle*
- *anterior auricular muscle*
- *Superior auricular muscle*
- *posterior auricular muscle*

*Both groups of muscles are innervated by the **facial nerve [VII]***

Arterial supply

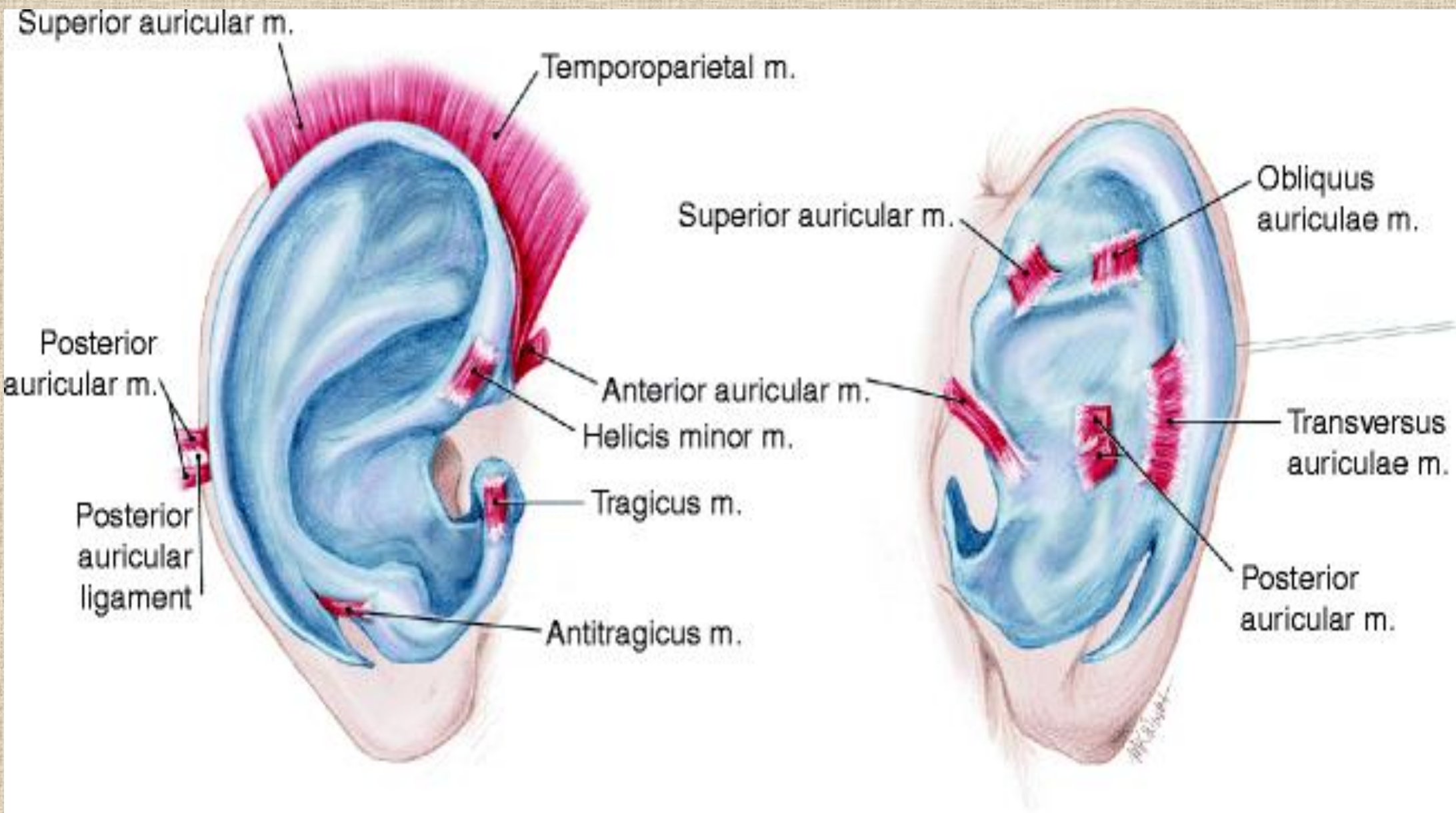
- *posterior auricular artery*
- *superficial temporal artery*

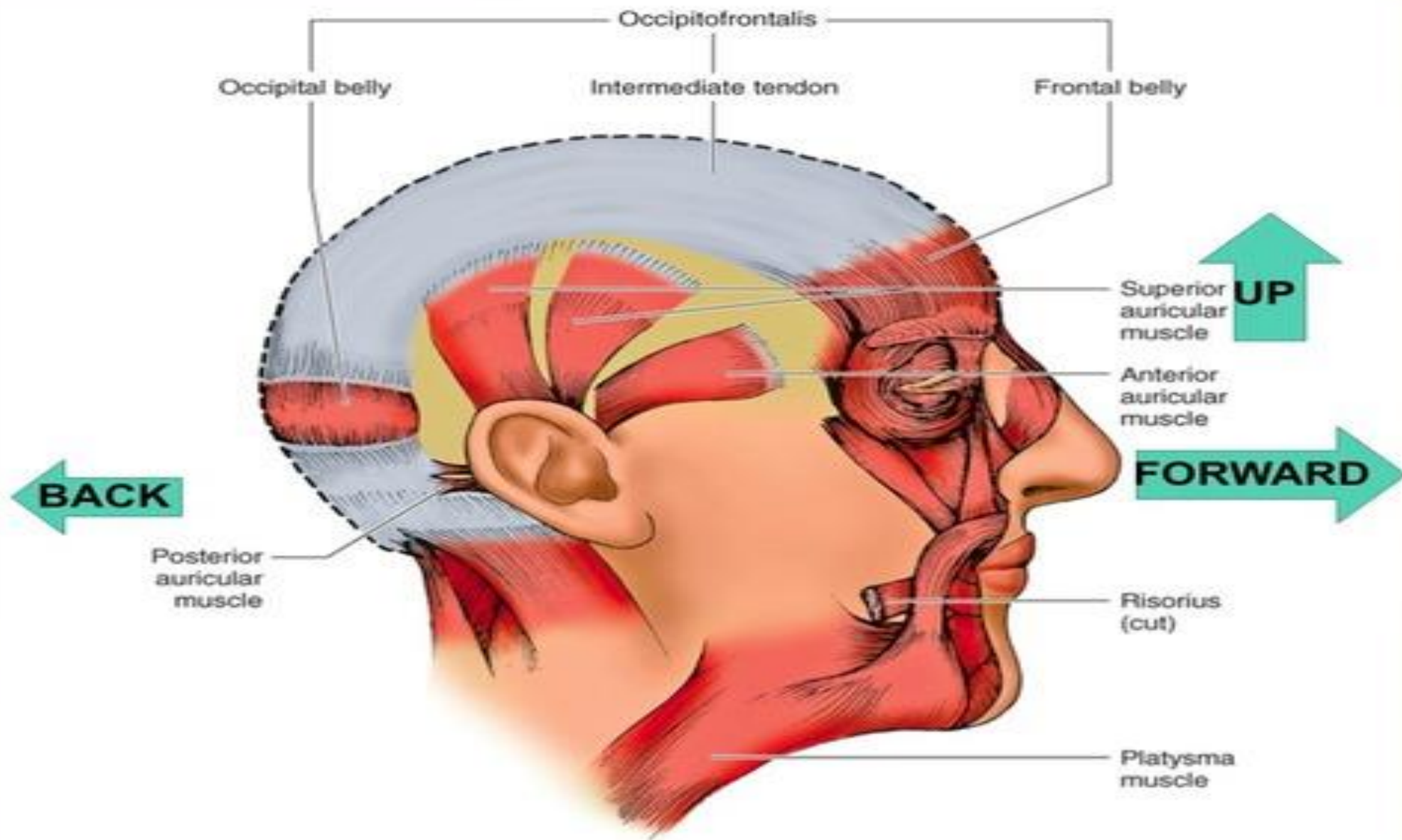
Venous drainage

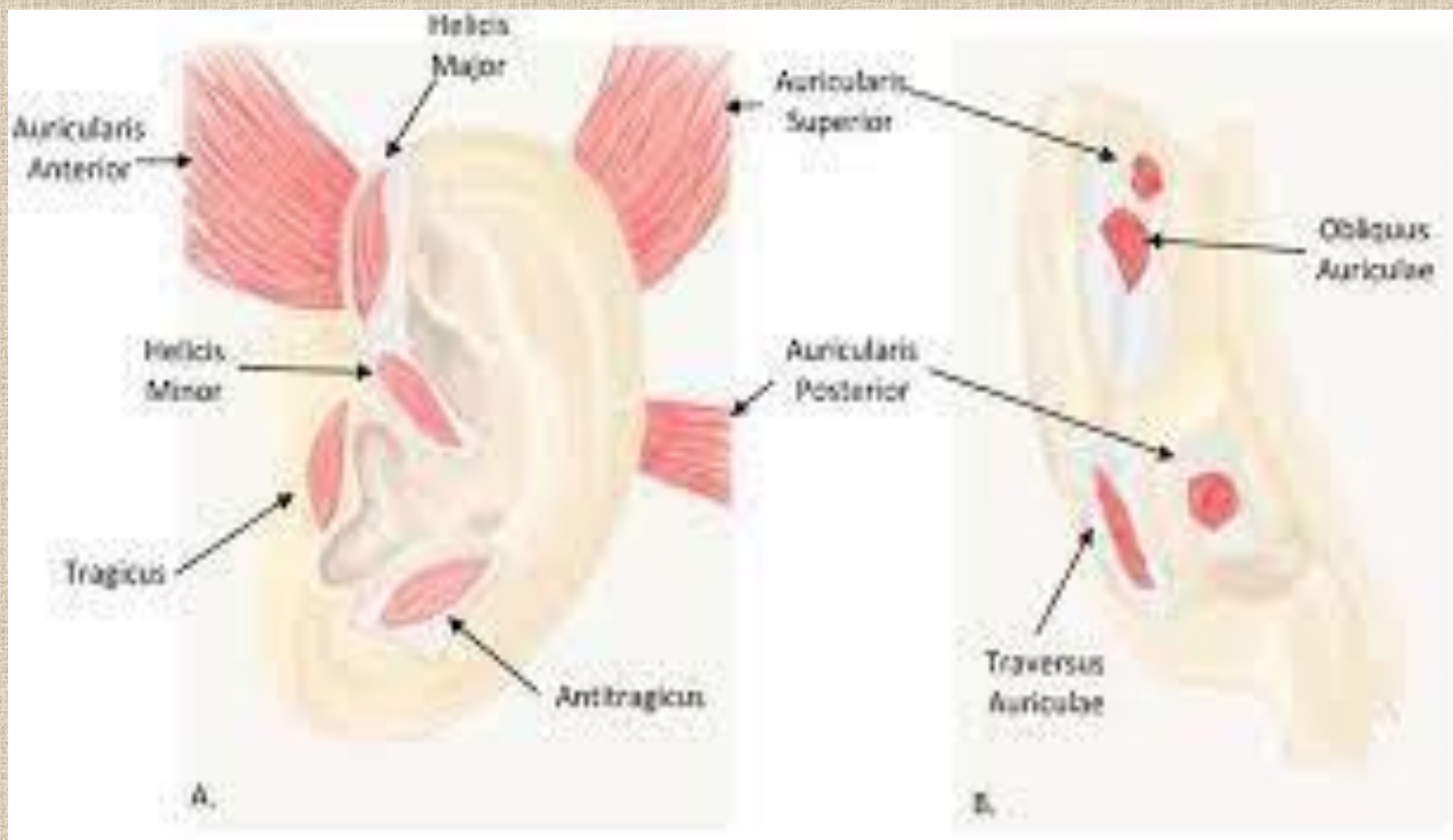
- *through vessels following the arteries*

KEY FACTS ABOUT THE EXTERNAL EAR

Parts	Auricle, external acoustic meatus
Blood supply	Posterior auricular, anterior auricular, minor branches of the occipital, deep auricular, stylomastoid, inferior tympanic arteries
Innervation	Auriculotemporal branch of the mandibular nerve, lesser occipital, great auricular nerve, auricular branch of the vagus nerve, branches of the facial nerve
Function	Conducts sound to the inner ear







Key facts about the extrinsic muscles of the external ear

Auricularis anterior

Origin: Temporal fascia/Epicranial aponeurosis
Insertion: Spine of helix
Innervation: Temporal branches of facial nerve
Function: Draws auricle anteriorly

Auricularis superior

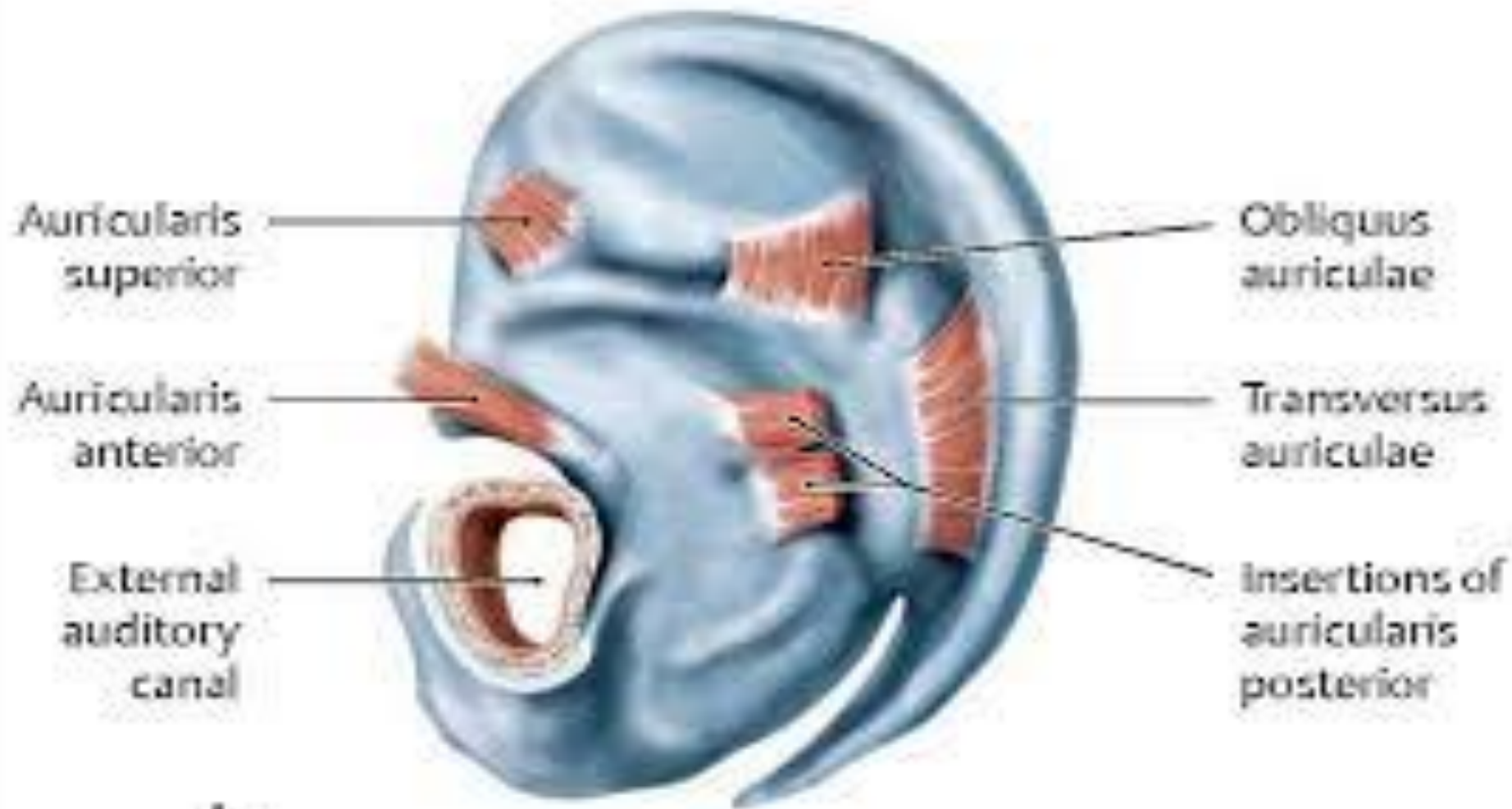
Origin: Epicranial aponeurosis
Insertion: Superior surface of auricle
Innervation: Temporal branches of facial nerve
Function: Draws auricle superiorly

Auricularis posterior

Origin: Mastoid process, Tendon of sternocleidomastoid muscle
Insertion: Ponticulus of conchal eminence
Innervation: Posterior auricular nerve (branch of facial nerve)
Function: Draws auricle posteriorly

KEY FACTS ABOUT THE EAR

Function	Hearing and maintaining balance
External ear	Parts: auricle, external acoustic meatus, tympanic membrane Function: capture and conduction of sound
Middle ear	Parts: tympanic cavity, auditory ossicles, muscles of the ossicles Function: transforming a high-amplitude low-force sound wave into a low-amplitude high-force vibration and transmitting it to the internal ear
Internal ear	Parts: bony labyrinth (vestibule, semicircular canals, cochlea) and membranous labyrinth (utricle, saccule, semicircular ducts, cochlear duct) Function: <ul style="list-style-type: none">- Bony labyrinth supports its membranous counterparts- Utricle and saccule provide information about the position of the head- Semicircular ducts provide information about movements of the head- Cochlear duct provides hearing information
Clinical relations	Auricular hematoma, otitis (externa, media, interna), blockage of the pharyngotympanic (Eustachian) tube, high tone deafness



b

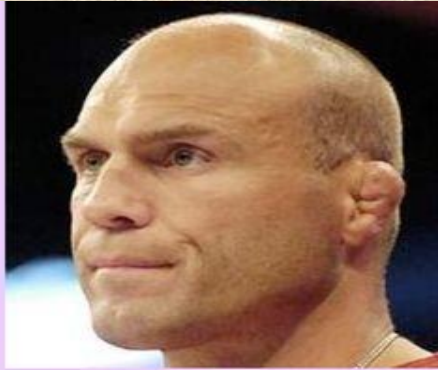
INNERVATION

- The sensory innervation to the skin of the auricle comes from numerous nerves:
- **Greater auricular nerve** (branch of the cervical plexus) – innervates the skin of the auricle
- **Lesser occipital nerve** (branch of the cervical plexus) – innervates the skin of the auricle
- **Auriculotemporal nerve** (branch of the mandibular nerve) – innervates the skin of the auricle and external auditory meatus.
- **Branches of the [facial](#) and [vagus](#) nerves** – innervates the deeper aspect of the auricle and external auditory meatus
- Some individuals can complain of an **involuntary cough** when cleaning their ears – this is due to stimulation of the auricular branch of the [vagus](#) nerve (the vagus nerve is also responsible for the cough reflex).

CLINICAL RELEVANCE

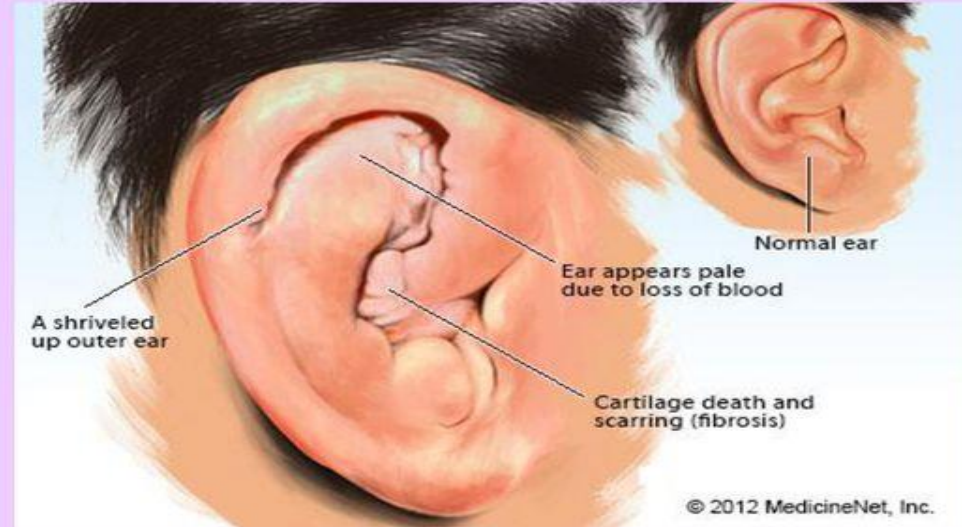
AURICULAR HAEMATOMA

- An **auricular haematoma** refers to a collection of blood between the cartilage of the ear and the overlying perichondrium. It usually occurs as a result of trauma, commonly seen in contact sports (e.g. rugby).
- The accumulation of blood can disrupt the blood supply to the cartilage, and requires prompt drainage. Untreated cases can result in avascular necrosis of the cartilage, resulting in a '**cauliflower ear**' deformity.



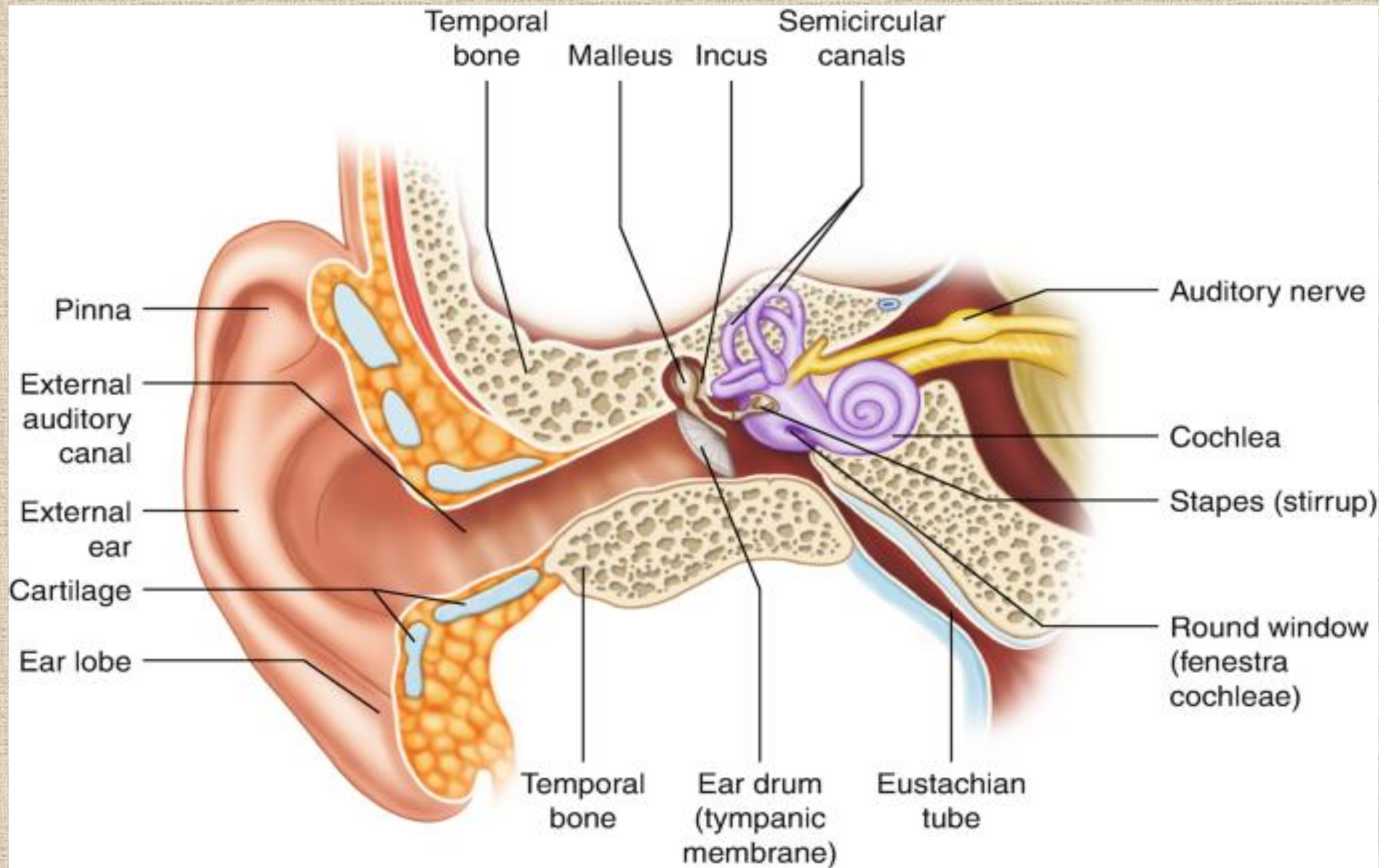
Cauliflower ear

- After **external trauma** to **auricle**
- Common in boxers
- Inflammation separates skin from cartilage
- Clots can cause cartilage to die & fold in on itself
- Scar tissue makes lumps more prominent



EXTERNAL ACOUSTIC MEATUS

- The **external acoustic meatus** is a sigmoid shaped tube that extends from the deep part of the concha to the tympanic membrane. The walls of the external 1/3 are formed by cartilage, whereas the inner 2/3 are formed by the temporal bone.
- The external acoustic meatus does not have a straight path, and instead travels in an S-shaped curve as follows:
 - Initially it travels in a **superoanterior** direction.
 - It then turns slightly to move **superoposteriorly**.
 - It ends by running in an **inferoanterior** direction.



TYMPANIC MEMBRANE

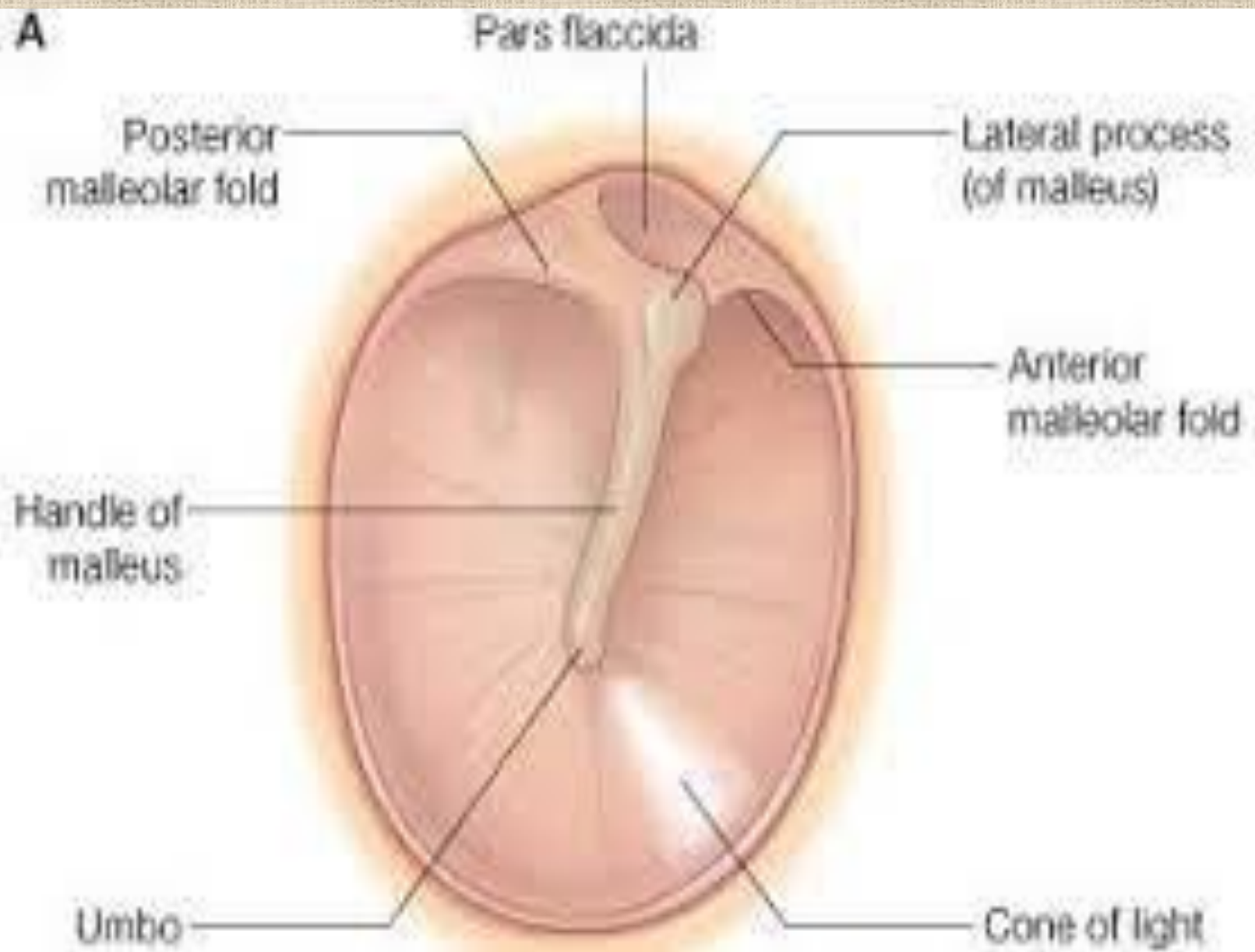
- The **tympanic membrane** lies at the distal end of the external acoustic meatus. It is a connective tissue structure, covered with skin on the outside and a mucous membrane on the inside. The membrane is connected to the surrounding temporal bone by a fibrocartilaginous ring.
- The translucency of the tympanic membrane allows the structures within the middle ear to be observed during otoscopy. On the inner surface of the membrane, the handle of malleus attaches to the tympanic membrane, at a point called the **umbo** of tympanic membrane.
- The **handle of malleus** continues superiorly, and at its highest point, a small projection called the lateral process of the malleus can be seen. The parts of the tympanic membrane moving away from the lateral process are called the anterior and posterior malleolar folds.

Clinical anatomy

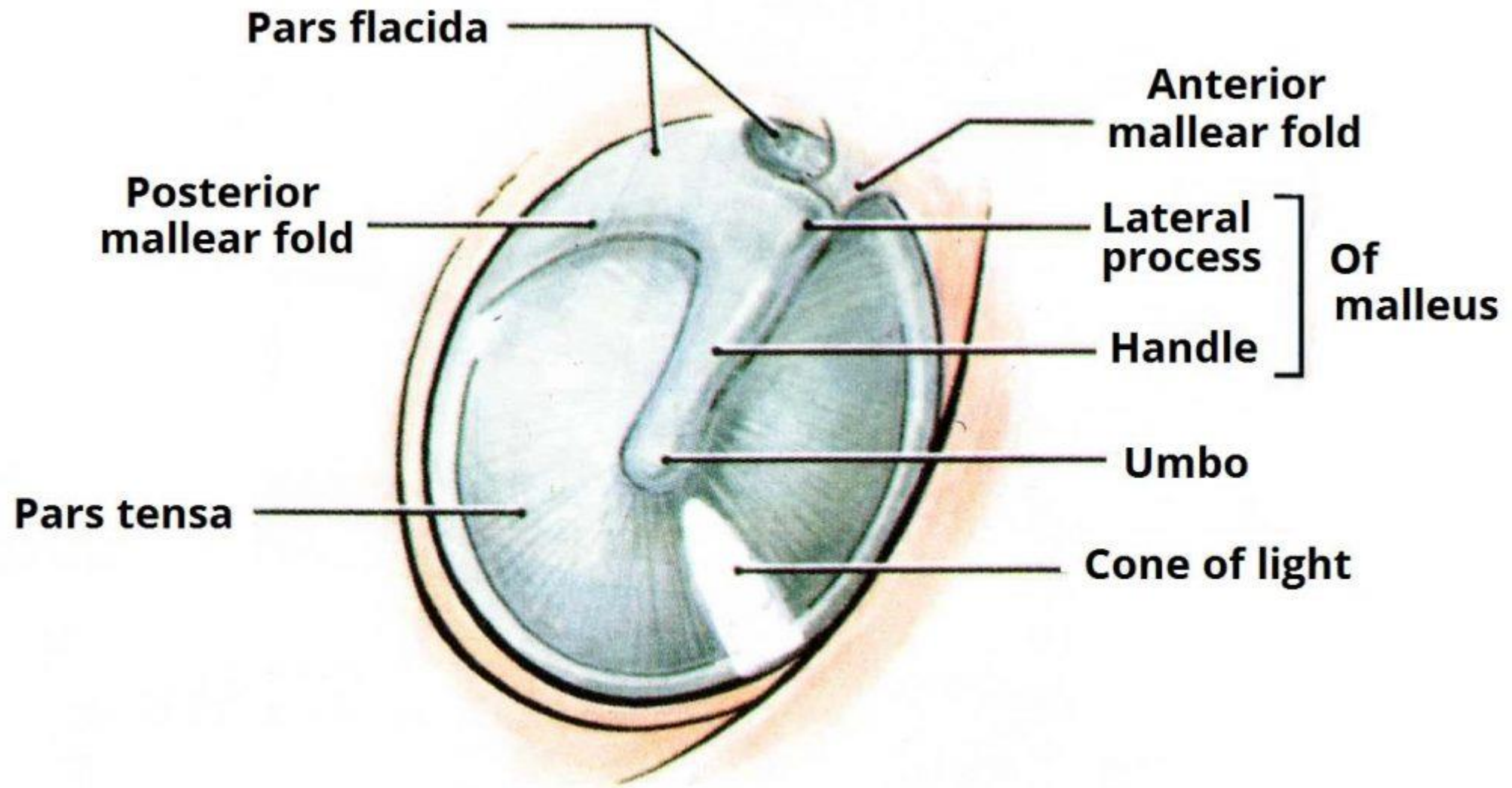
- *Excess production of cerumen can press against the eardrum and/or occlude (block) the external auditory canal or hearing aids, potentially hindering hearing*

Tympanic membrane (ear drum)

- *is a membrane that separates the **external acoustic meatus** from the **middle ear***
- *is a thin, oval semi-transparent membrane*
- *approximately 1 cm in diameter*
- *it is covered with **thin skin** externally and with **mucous membrane of the middle ear** internally*
- *When viewed through an otoscope, the tympanic membrane appears **concave** toward the external acoustic meatus with a **shallow, cone-like central depression***
- *the peak of this cone like depression is called the **umbo of the tympanic membrane***



- *The lower end of the **handle of malleus** is attached to the umbo of tympanic membrane*
- *Superior to the handle of the malleus is a small elevation called the **lateral process of the malleus***
- *the part of the tympanic membrane superior to the lateral process of the malleus is **thin** and is called the **flaccid part /pars flaccida***
- *the remaining part of the membrane is thick and is called **the tense part /pars tensa***
- *The **pars flaccida** lacks the **radial** and **circular fibers** present in the remaining part of the membrane*
- *in the anterior-inferior quadrant of the membrane is a bright triangular reflection of light called the **cone of light***
- *This region is usually visible when examining the tympanic membrane with an otoscope*



THE TYMPANIC MEMBRANE OF THE EAR.

innervation

- *external surface of the tympanic membrane is supplied;*
- ✓ *the auriculotemporal nerve (a branch of CN V₃) {main contribution}*
- ✓ *a small auricular branch of the vagus (CN X)*
- *The internal surface of the tympanic membrane is supplied by the glossopharyngeal nerve (CN IX)*

Clinical anatomy

External Ear Injury

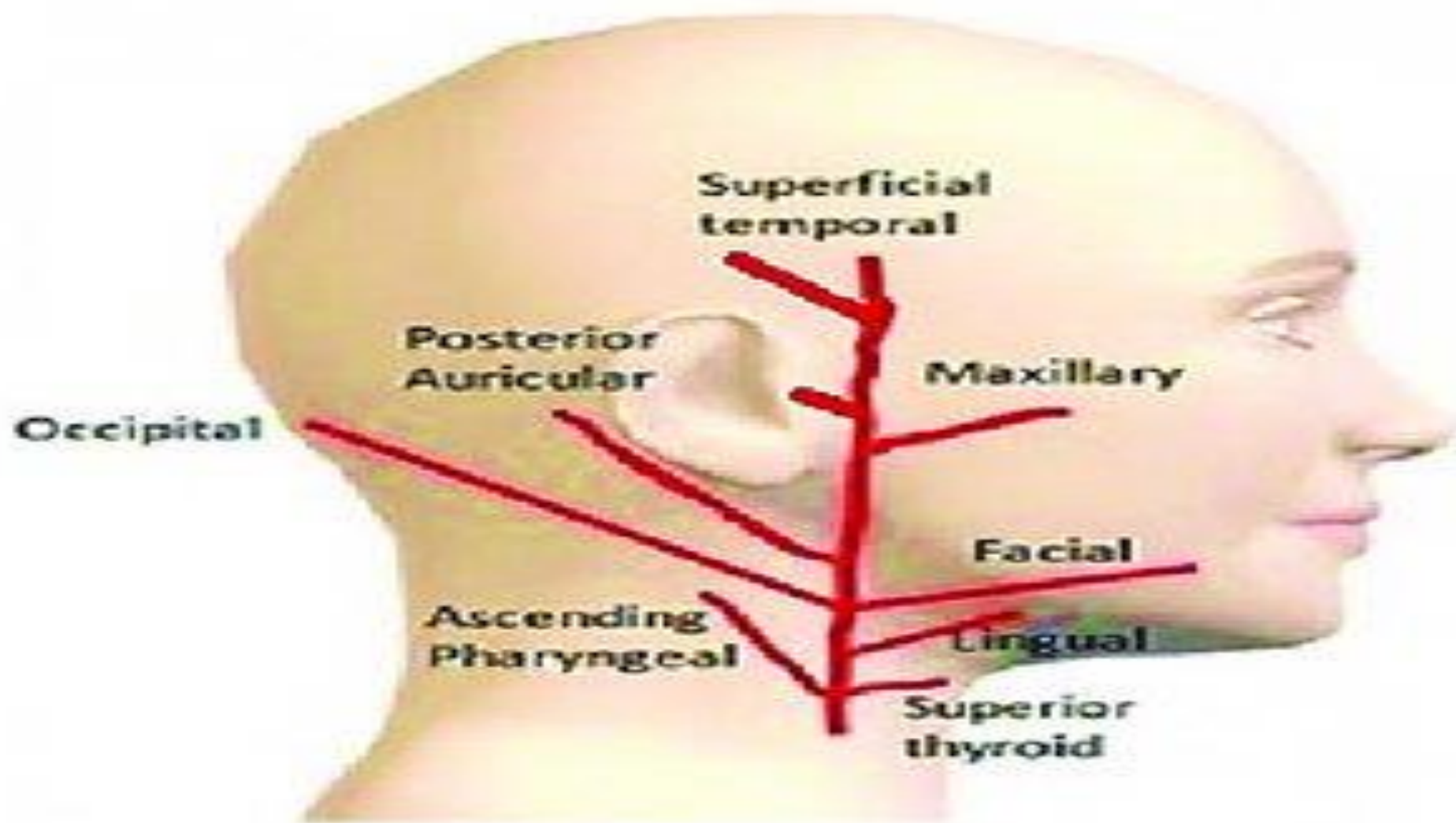
- *Bleeding within the auricle resulting from trauma may produce an auricular hematoma*

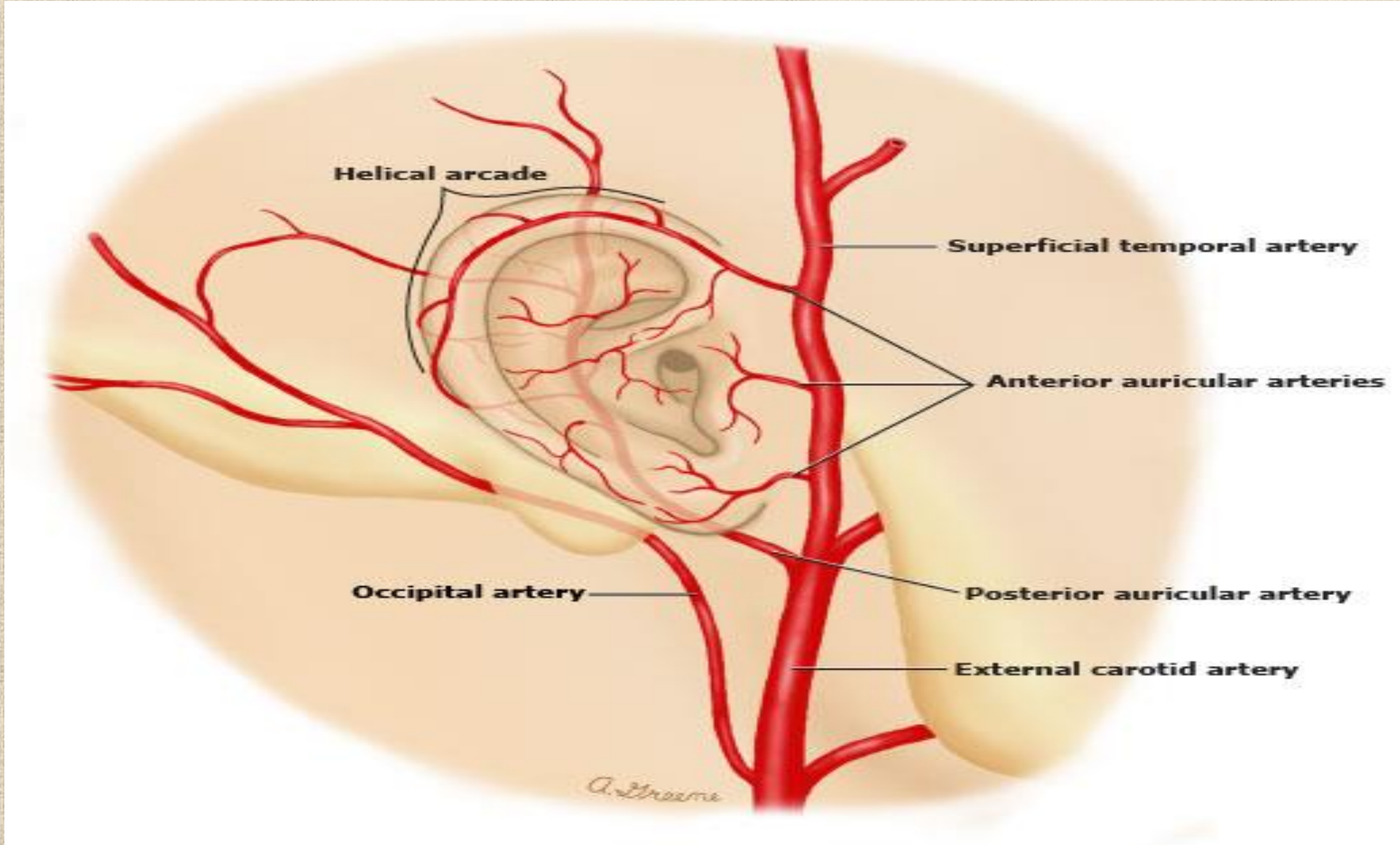
Acute Otitis Externa

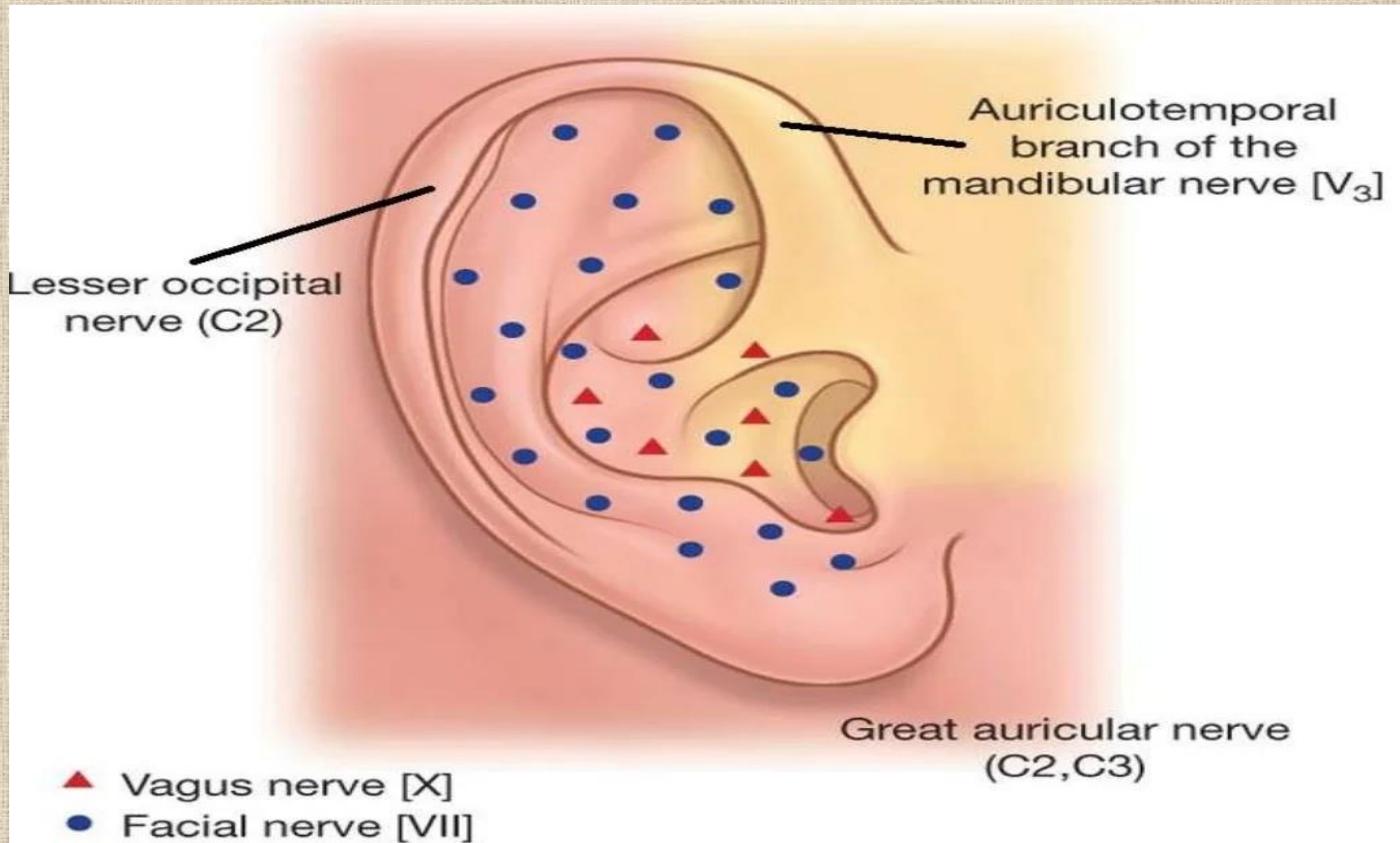
- *Otitis externa is an inflammation of the external acoustic meatus*
- *The infection often develops in swimmers who do not dry their meatus after swimming and/or use ear drops*
- *it may also be the result of a bacterial infection of the skin lining the meatus*

VASCULATURE

- The external ear is supplied by branches of the **external carotid artery**:
- **Posterior auricular artery**
- **Superficial temporal artery**
- **Occipital artery**
- **Maxillary artery** (deep auricular branch) – supplies the deep aspect of the external acoustic meatus and tympanic membrane only.
- Venous drainage is via veins following the arteries listed above.







LYMPHATICS

- The **lymphatic drainage** of the external ear is to the superficial parotid, mastoid, upper deep cervical and superficial cervical nodes.

CLINICAL RELEVANCE

PERFORATION OF THE TYMPANIC MEMBRANE

- The tympanic membrane is a relatively thin connective tissue structure, and is susceptible to **perforation** (usually by trauma or infection).
- An infection of the middle ear (**otitis media**) causes pus and fluid to build up behind the tympanic membrane. This causes an increase in pressure within the middle ear, and eventually the eardrum can rupture.
- In some cases the tympanic membrane heals itself, but in larger perforations surgical grafting may be required.

Table 2. Diagnosis of Otitis Externa

Onset of symptoms within 48 hours in the past three weeks

and

Symptoms of ear canal inflammation:

Ear pain, itching, or fullness

With or without hearing loss or jaw pain

and

Signs of ear canal inflammation:

Tenderness of tragus/pinna or ear canal edema/erythema

With or without otorrhea, tympanic membrane erythema, cellulitis of the pinna, or local lymphadenitis

Adapted with permission from Rosenfeld RM, Brown L, Cannon CR, et al.; American Academy of Otolaryngology–Head and Neck Surgery Foundation. Clinical practice guideline: acute otitis externa. Otolaryngol Head Neck Surg. 2006;134(4 suppl):S5.

OTITIS EXTERNA



- Pain, located in the ear itself;
- Purulent discharges;
- Slight hearing loss;
- Usually temperature is normal.





INNERVATION

- The inner ear is innervated by the [vestibulocochlear nerve \(CN VIII\)](#). It enters the inner ear via the internal acoustic meatus, where it divides into the **vestibular nerve** (responsible for balance) and the **cochlear nerve** (responsible for hearing):
- **Vestibular nerve** – enlarges to form the vestibular ganglion, which then splits into superior and inferior parts to supply the utricle, saccule and three semi-circular ducts.
- **Cochlear nerve** – enters at the base of the modiolus and its branches pass through the lamina to supply the receptors of the Organ of Corti.
- The [facial nerve](#), CN VII, also passes through the inner ear, but does not innervate any of the structures present.

THANK YOU

THANK YOU