

Ear

Curricular Objectives

By the end of this session students are expected to:

Theory

1. Outline the three parts of the ear, their location and subdivisions
2. Summarize the composition and main features of the auricle
3. Describe the two parts of EAM, and compare the structure of the skin of lining each part
4. Appraise the importance of the flexibility of the EAM in examination of ear
5. Outline the location of tympanic membrane & the main features of its external surface
6. Review the nerve supply of EAM & tympanic membrane
7. Define the middle ear and list its content, function and sensory supply
8. Underline the location, function, & nerve supply of tensor tympani & stapedius muscles
9. Describe the boundaries and relations of the middle ear essential in clinical practice
10. Describe the auditory (Eustachian) tube and its functional importance
11. Review the function and clinical importance of middle ear communications
12. Explain the involvement of middle ear in upper respiratory tract infections
13. Conclude the structure affected by middle ear infection from their manifestations
14. Outline the location and the structural components of internal ear
15. Summarize the function and nerve supply of different parts of membranous labyrinth
16. Discuss the structural organization of the cochlea and cochlear duct
17. Review the content of the internal auditory meatus

Practical

1. Recall the function of each of the three parts of the ear
2. Identify the main landmarks of the auricle and external auditory meatus (EAM)
3. Use the tragus to identify and palpate the Temporomandibular joint
4. Distinguish the temporal bone and its different parts
5. Recognize tympanic membrane and label main landmarks of its external surface
6. Locate the middle ear and label the ossicles
7. Identify the oval and round windows and the structures closing them
8. Trace the chorda tympani on the surface of tympanic membrane
9. Identify the tensor tympani & stapedius muscles and notice their attachment
10. Mark the Aditus & auditory tube and the cavities into which they open
11. Identify the three different parts forming the internal ear and state their function
12. Trace the cochlear and vestibular nerves within the petrous bone
13. Label the EAM and mastoid air cells in a lateral skull X-ray
14. Palpate the mastoid process for tenderness related to middle ear infection

Selected references and suggested resources

- ✦ Clinical Anatomy by Regions, Richard S. Snell, 9th edition
- ✦ Grant's Atlas of Anatomy, 13th Edition
- ✦ McMinn's Clinical Atlas of Human Anatomy, 7th Edition
- ✦ [Anatomy for Babylon medical students](#) (facebook page)
- ✦ [Anatomy for Babylon medical students](#) (youtube channel)
- ✦ [Human Anatomy Education](#) (facebook page)
- ✦ [Human anatomy education](#) (youtube channel)

Feedback and suggestions

- ✦ <http://goo.gl/forms/SjyjGeUpvH>

Session check list

❖ Clinical highlights

- ✦ Infection of the external and middle ear, hearing problems and deafness are some of the clinical problems encountered in clinical practice
- ✦ Vertigo is sometimes the presenting symptom of ear diseases although it may be caused by more serious problems
- ✦ memorizing the course of facial nerve and its chorda tympani branch within the ear is of great importance in diagnosing the site of facial nerve lesion

❖ Functions of the ear

- 1) 2)

❖ Parts of ear

- 1) External ear 2) Middle ear (Tympanic cavity) 3) Internal ear (Labyrinth)

❖ External ear

- Auricle is composed of a cartilage (elastic) covered by skin, It act to
- External auditory meatus (EAM) is a **curved** tube leads from the auricle laterally to the tympanic membrane medially, It is lined by
- The outer 1/3rd of the EAM is flexible, made of cartilage lined by skin containing ceruminous glands which secrete wax
- The Inner 2/3rds of the EAM are fixed, made of bone lined by skin with no ceruminous glands
- ✦ Clinical note: **Boils** (infection of hair follicle) affecting EAM (even small sized) are very painful because the lining skin is firmly adherent to underlying cartilage

❖ Tympanic membrane

- Location: Partition between and
- Shape: A semitransparent membrane, pearly gray colored, and concave laterally
- ✦ **Note:** Vagus nerve (auricular branch) provide sensory supply to part of the EAM and lateral surface of the tympanic membrane and this is why some patients develop cough when cleaning ear from wax

❖ Middle ear (tympanic cavity)

- Location and content: It is a cavity filled with **air**
- ⊕ It is lined by And it contains and
- Boundaries: formed by 6 walls separating the middle ear from 6 spaces
- Sensory supply: Glossopharyngeal nerve

❖ Internal ear (labyrinth): Organs of hearing and balance

- It is made of a membranous part covered by bony part
- Bony part is formed of intercommunicating cavities & canals filled with fluid (perilymph)
- Membranous part is a closed system of sacs and ducts communicating with each other, filled with fluid (Endolymph)
- Comparable parts of bony and membranous labyrinth
 1. Cochlea.....>>>>> cochlear duct
 2. Vestibule.....>>>>> utricle and saccule
 3. Semicircular canals...>>>>> Semicircular ducts and their ampullae

Lab activity list

For each task below, identify the listed structures then answer the related questions

❖ Task 1 (External ear):

- ✓ Auricle: Tragus/ Lobule/ Helix
- ✓ External auditory meatus: bony part/ cartilaginous part
- ⊕ **Palpate & describe:** Put the tip of your finger just in front of tragus, open and close the mouth. Describe what you feel

❖ Task 2 (tympanic membrane): Draw a simple diagram showing the following structures

- ✓ Umbo: a small depression
- ✓ Cone of light
- ✓ Anterior and posterior malleolar folds
- ✓ Pars flaccida/ Pars tensa

❖ Task 3 (middle ear):

- ✓ Petrous part of temporal bone
- ✓ Auditory ossicles: Malleus/ incus/ stapes
- ⊕ Find the muscle attached to the malleus and state its nerve supply
- ⊕ Find the muscle attached to the stapes and state its nerve supply and function

❖ Task 4 (boundaries of middle ear):

- ✓ Roof: Tegmen tympani
- ⊕ It separates the tympanic cavity from the content of _____ fossa
- ✓ Floor: (thin plate)
- ⊕ Separates the cavity from _____ vein
- ✓ Anterior wall: Tensor tympani muscle/ Auditory tube
- ⊕ It is separates the tympanic cavity from _____
- ✓ Posterior wall: Aditus/ Pyramid
- ⊕ The aditus leads to _____
- ⊕ What does the pyramid represents?
- ✓ Lateral wall: Tympanic membrane
- ⊕ Which nerve passes over the medial side of tympanic membrane
- ✓ Medial wall: Promontory/ Oval window (**Fenestra vestibuli**)/ Round window (**fenestra cochlea**)
- ⊕ It is separates the tympanic cavity from _____
- ⊕ What is the most prominent structure in this wall?
- ⊕ At the lower posterior part of this wall lies the _____ which is closed by _____

🚩 **Note:** The facial nerve runs in the upper posterior part of this wall covered by thin bone (may be absent in some people).

❖ Task 5 (Communications):

- ✓ Auditory tube
- ⊕ To which cavity it opens?
- ⊕ Differentiate between its two parts
- ✓ Mastoid process/ Mastoid antrum/ Mastoid air cells
- ⊕ Look at a lateral skull x-ray and describe the parts of ear visible to you

❖ Task 6 (internal ear):

- ✓ Cochlea/ cochlear duct/ Cochlear nerve
- ✓ Vestibule/Vestibular nerve/Oval window/Round window/ Utricle/ Saccule
- ✓ Semicircular canals/ Semicircular ducts/ ampullae of Semicircular ducts
- ⊕ Through which canal does the VIII nerve pass after exiting the internal ear?
- ⊕ What are the content of the boney labyrinth?
- ✓ Modulus/ Spiral lamina/ Spiral ganglion
- ✓ Organ of Corti/ Basilar membrane/ Vestibular membrane
- ✓ Scala vestibule/ Scala tympani
- ⊕ Where the perilymph is located?

Review questions:

- ⊕ Which part of the ear secretes wax? What function does the wax serve?
- ⊕ Describe the attachment of the malleus to the tympanic membrane
- ⊕ Name the structure anchoring the stapes to the oval window
- ⊕ Compare the function of the three parts of internal ear
- ⊕ Scala vestibuli and tympani are continuous with each other. How?
- ⊕ What is the function of the vestibular nerve?
- ⊕ What is the function of the organ of Corti

Homework

- ⊕ The EAM is flexible in part of its course.
 1. Which part of the EAM is flexible?
 2. This fact is of great importance to help examining the ear. How?
- ⊕ A pain behind the auricle may be due Laryngeal cancer. How?
- ⊕ Myringotomy (incision in the tympanic membrane) is sometimes done to drain the pus from the middle ear. The incision is made in the lower part of the membrane to avoid injury to an important nerve, name this nerve, outline the area it supplies and the type of the fibers it carries
- ⊕ Middle ear infection is common especially in children.
 1. Which region is the usual primary source of infection?
 2. What is the rule of chewing gum in the process of healing?
 3. Which cranial nerve may be affected by this infection? What is the consequence of its injury?
- ⊕ Define **Hyperacusis** and indicate the nerve lesion that can cause it