ENT/ OTORHINOLARYNGOLOGY

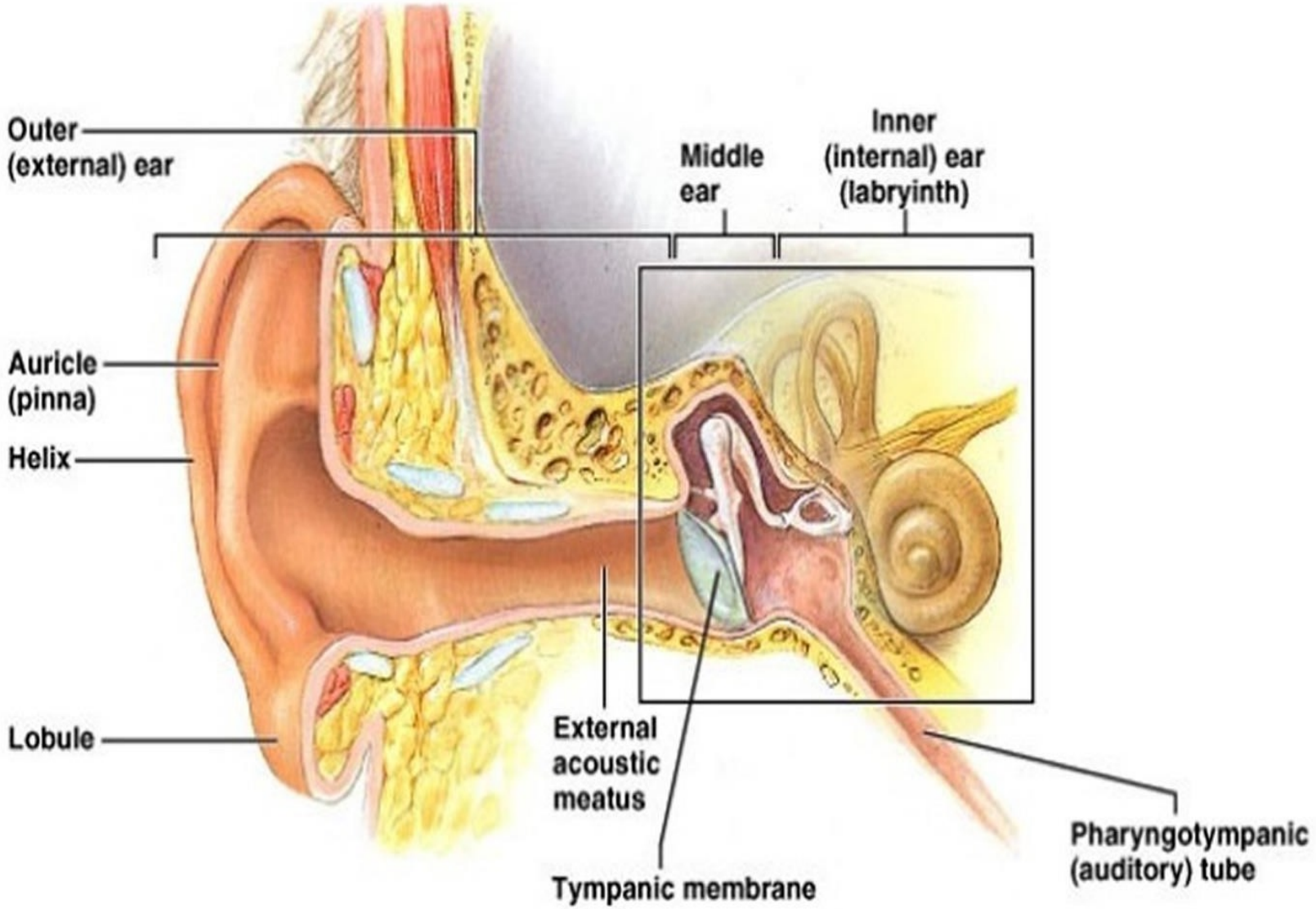
1. Otorhinolaryngology/ENT
2. Otorhinolaryngologists /ENT Specialists
3. Anatomy and physiology of Human ear
4. Structure of the Nasal cavity , Pharynx and Larynx
5. Examination of ENT
6. Otologic Diseases and conditions
7. Diseases of the nose and throat

STRUCTURE OF EAR

- **PARTS**
  - **OUTER EAR**
  - **MIDDLE EAR**
  - **INNER EAR**

- The **outer ear** is called the **pinna / auricle** – flap / projecting part and is made of ridged cartilage covered by skin.
- The **external auditory meatus (auditory canal)** leads from the pinna and is lined with numerous glands that secrete a yellowish brown, waxy substance called **cerumen**. Cerumen lubricates and protects the ear.

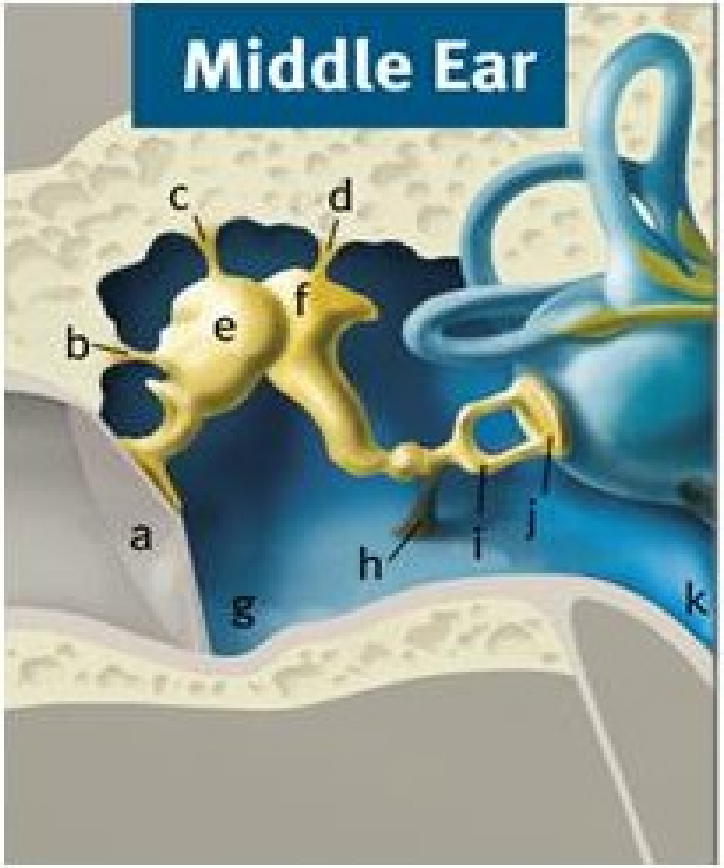
The Outer (External) Ear



MIDDLE EAR

- Sound travels through the pinna into the external auditory canal & strike a membrane between the outer and the middle ear - **tympanic membrane, or eardrum**. As the eardrum vibrates, it moves **three small bones, or ossicles,** that conduct the sound waves through the middle ear.
- Ossicles are the tiny bones of the ear**: malleus(hammer**), **incus(anvil), stapes(stirrup)(smallest bone)**
- As the stapes moves, it touches a membrane called the **oval window / fenestra ovalis** - separates the middle from the inner ear.

- The **stapes** are attached to the surface of the cochlea at a spot called the oval window or fenestra ovalis.
- The **cochlea** is filled with fluid and has tiny nerve endings called the **hairs of Corti**
- **Auditory or eustachian tube** is a canal leading from the middle ear to the pharynx.
- **closed but opens on swallowing** - can prevent damage to the eardrum and shock to the middle and inner ears (equalizing pressure inside the tympanic cavity with that of the outside)



a) Eardrum

b) Lateral malleolar ligament

c) Upper malleolar ligament

d) Incudal ligament

e) Malleus

f) Incus

g) Middle ear

h) Stapedius muscle

i) Stapes

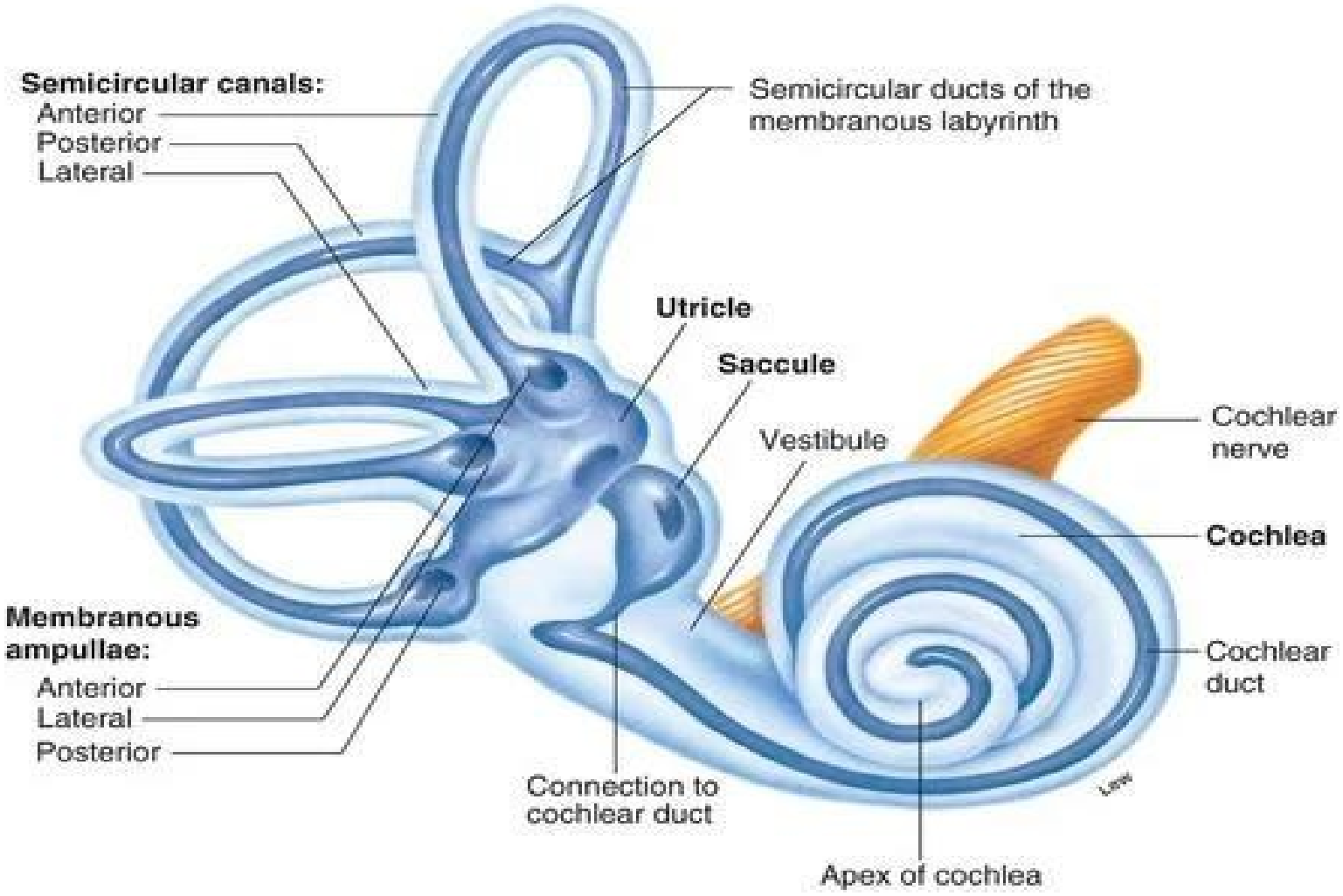
j) Stapes footplate and oval window

k) Eustachian tube

INNER EAR

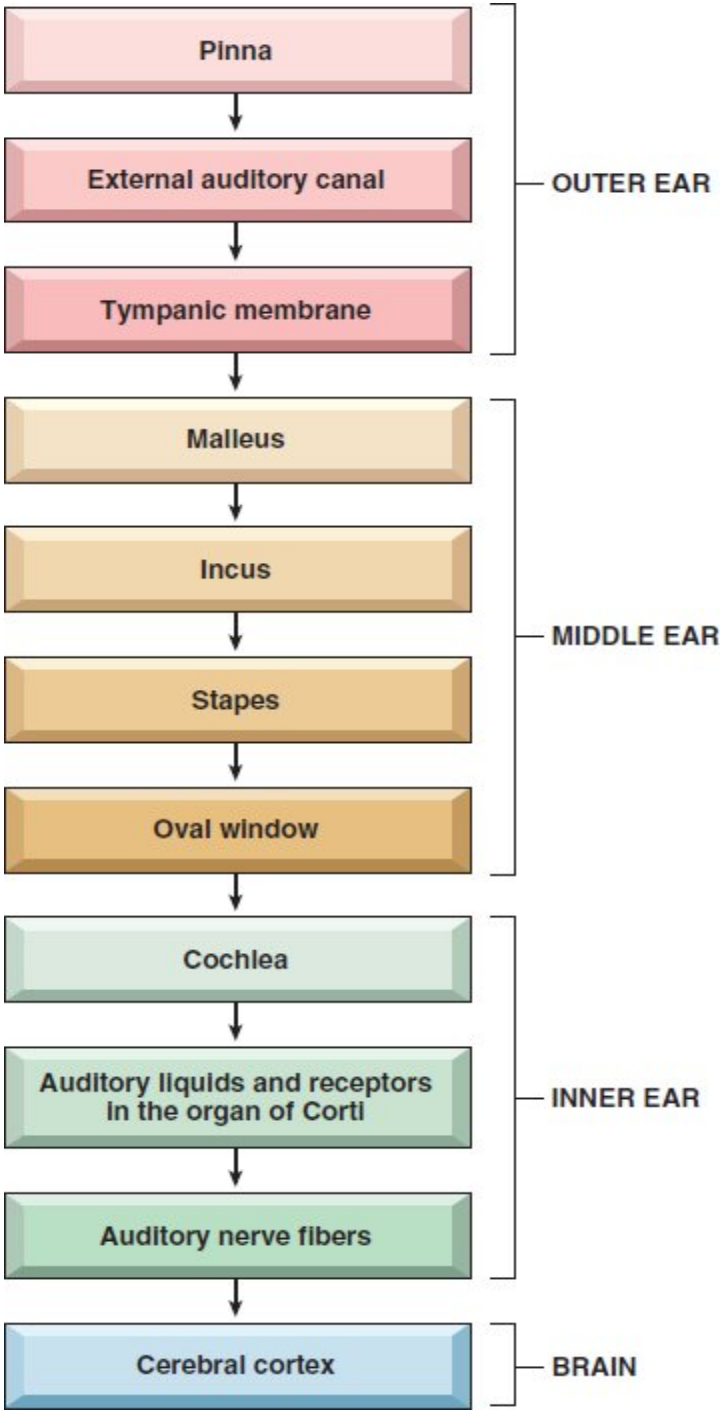
- Sound vibrations transmitted by the movement of the eardrum to the bones of the middle ear - reach the inner ear via the fluctuations of the **oval window** (separates the middle and inner ears).
- The inner ear is also called the **labyrinth** because of its circular, maze-like structure. The part of the labyrinth that leads from the oval window is a bony, snail shell–shaped structure called the **cochlea.** The cochlea contains special auditory liquids called perilymph and endolymph through which the vibrations travel.
- Also present in the cochlea is a sensitive auditory receptor area called the **organ of Corti**. In the organ of Corti, tiny hair cells receive vibrations from the auditory liquids - auditory nerve fibers - auditory center of the cerebral cortex - impulses are interpreted and “heard.

INNER EAR


Semicircular canals:
Anterior
Posterior
Lateral
Semicircular ducts of the membranous labyrinth
Utricle
Saccule
Vestibule
Cochlear nerve
Cochlea
Membranous ampullae:
Anterior
Lateral
Posterior
Cochlear duct
Connection to cochlear duct
Apex of cochlea

PHYSIOLOGY OF EAR

- Sound causes the eardrum and its tiny attached bones in the middle portion of the ear to vibrate, and the vibrations are conducted to the nearby **cochlea**.
- Cochlea transforms sound into nerve impulses that travel to the brain.
- The fluid-filled **semicircular canals (labyrinth**) attach to the cochlea and nerves in the inner ear.
- The **eustachian (auditory) tube** drains fluid from the middle ear into the throat (pharynx) behind the nose.

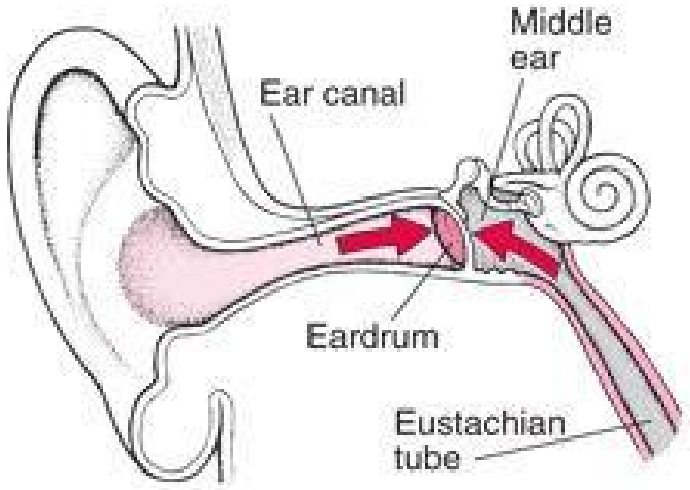

Pinna
External auditory canal
Tympanic membrane
OUTER EAR
Malleus
Incus
Stapes
Oval window
MIDDLE EAR
Cochlea
Auditory liquids and receptors in the organ of Corti
Auditory nerve fibers
INNER EAR
Cerebral cortex
BRAIN

TRANSMISSION OF SOUND

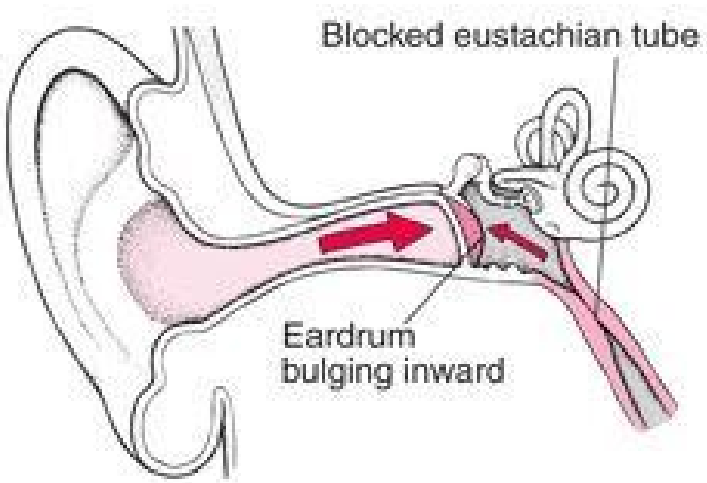
- The sound waves are transmitted within the ear in 2 phases:

1. **Conductive phase**
2. **Sensorineural phase**

- The sound waves travel through the external and middle ear by conduction
- The sensorineural phase involves the cochlea and the vestibulo cochlear nerve
- The eustachian tube connects the middle ear to the naso pharynx and plays an important role in equalizing pressure inside the tympanic cavity with that of the outside air



Equal Air Pressure



Unequal Air Pressure

TYPES OF BODY EQUILIBRIUM

- There are 2 types of body equillibrium (sense of balance):

1. **Static** – allows to determine the current position of head in relation to gravity (semi circular canals)
2. **Dynamic (kinetic)** – allows to evaluate the head movements in relation to gravity (vestibule)

NASAL CAVITY

1. The flared portion on each side of the nose is called **ala nasi**
2. The two openings is called anterior nares with tiny hairs present inside called **vibrissae** (removal of dirt particles)
3. The vestibule lies immediately inside the opening of the nostril where the space widens
4. Septum divides the nasal cavity in to two chambers-**nasal fossa**
5. The bony roof present on each nasal fossa is called **cribriform plate**
6. The lateral walls of the fossa are formed by thin, bony plates called **turbinates or conchae**

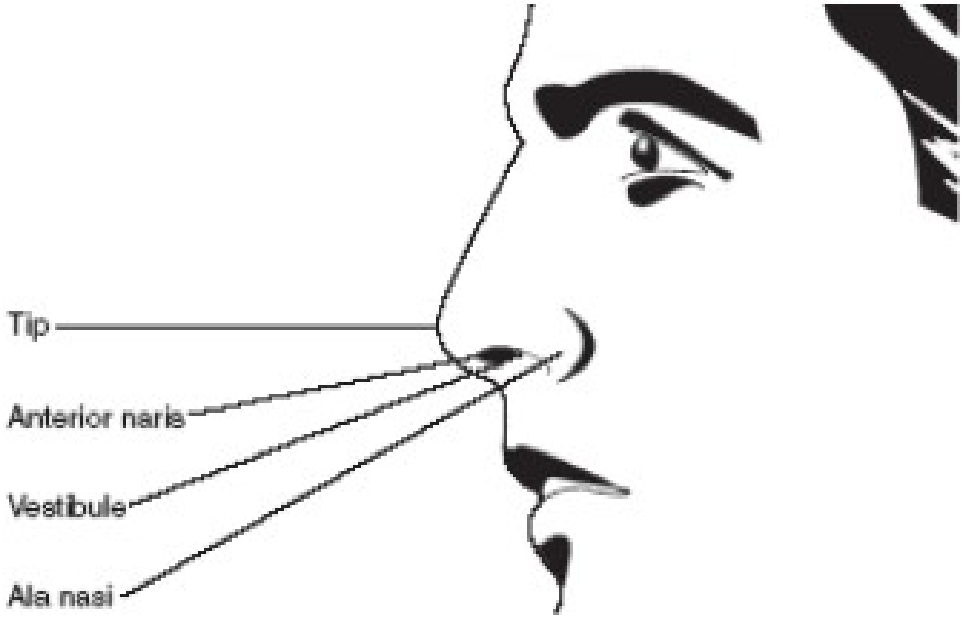


Figure 11-2 External Components of the Nose

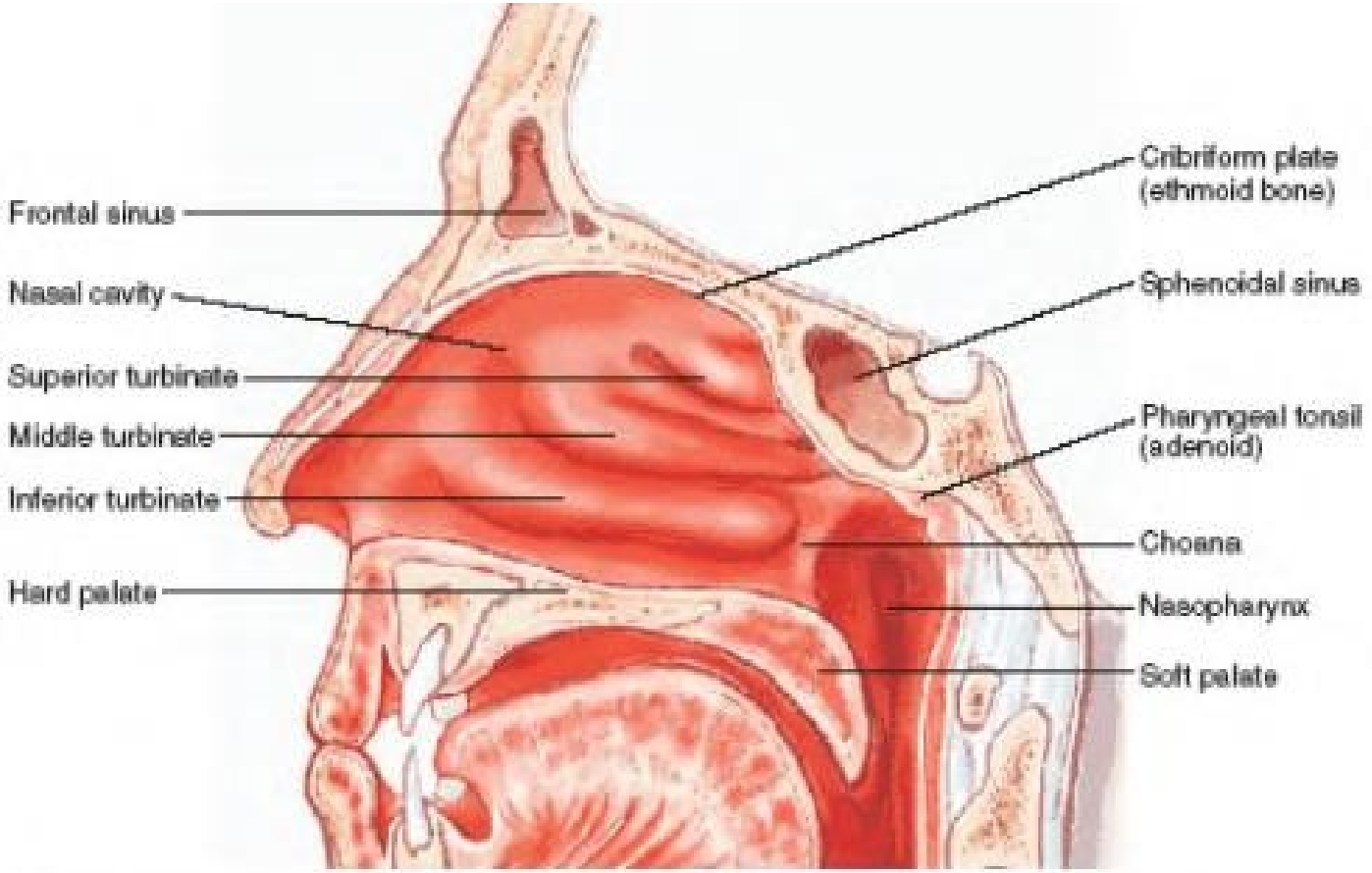


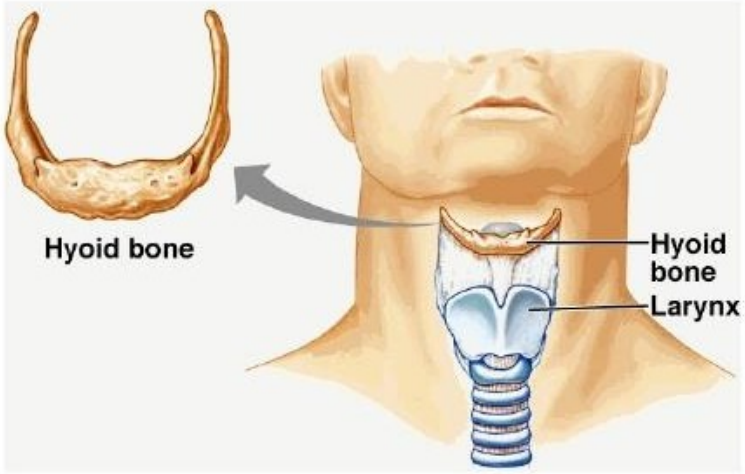
Figure 11-3 Nasal Cavity

- **Olfactory neurons** are composed of special receptors to detect odors
- **Nasal meatus** is a passageway formed by the turbinates
- **Choana** lies at the posterior part of the nasal cavity
- **Hyoid bone** is a U-shaped structure located in the anterior neck
- The **nasopharynx** forms the superior portion of the pharynx(throat)

Skull Subdivision Four

Hyoid Bone

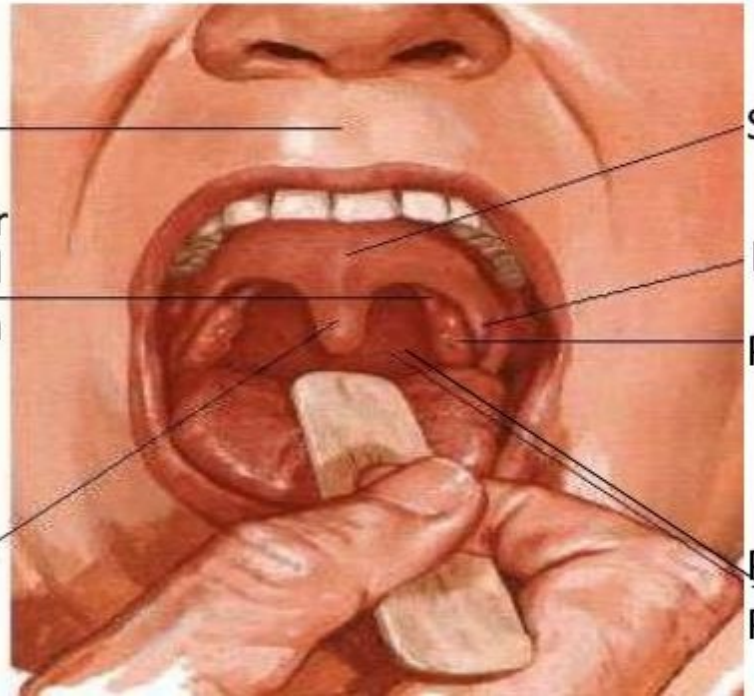
This bone is located beneath the mandible and serves to support the tongue and to provide an attachment surface for many of the muscles that control the tongue and function in swallowing.



1. The **nasopharynx (naso-pharynx**)- posterior to the nose
2. The **oropharynx (oral –pharynx**)- posterior to the mouth
3. The **laryngopharynx (laryngeal –pharynx**)- posterior to the larynx
4. The floor of the nasopharynx is called **soft palate**
5. A soft grape shaped tissue which extends down from the posterior edge of the soft palate is known as **uvula**

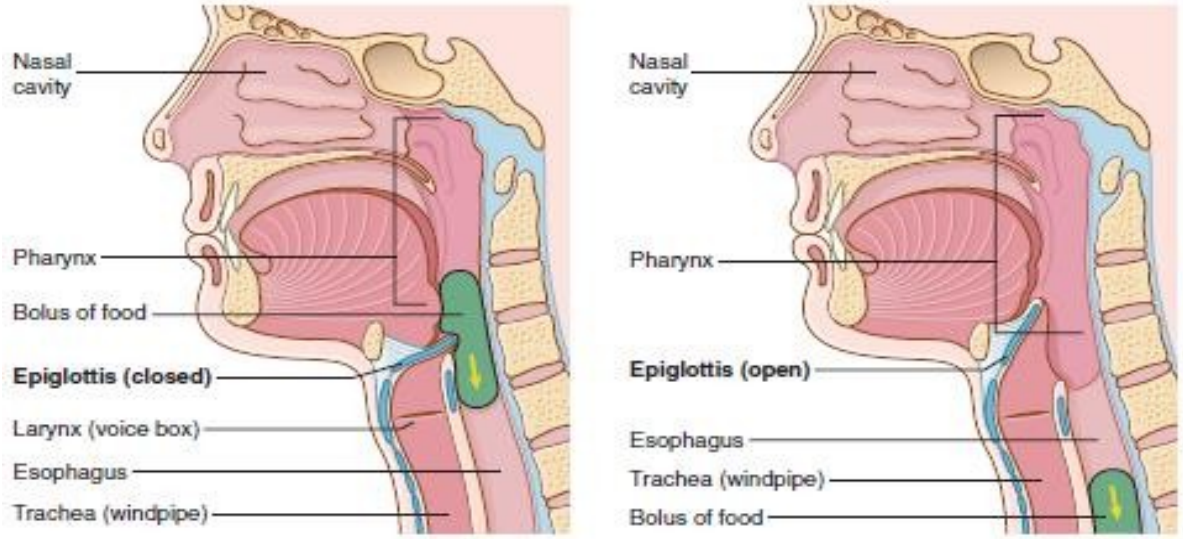
OROPHARYNX

It is the middle part of the pharynx situated behind the oral cavity.



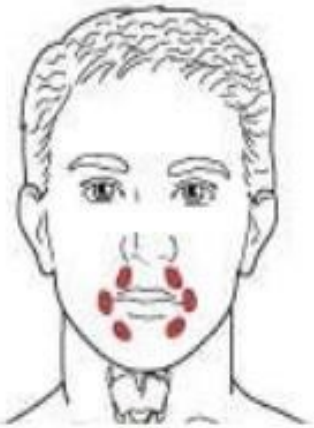
OROPHARYNX

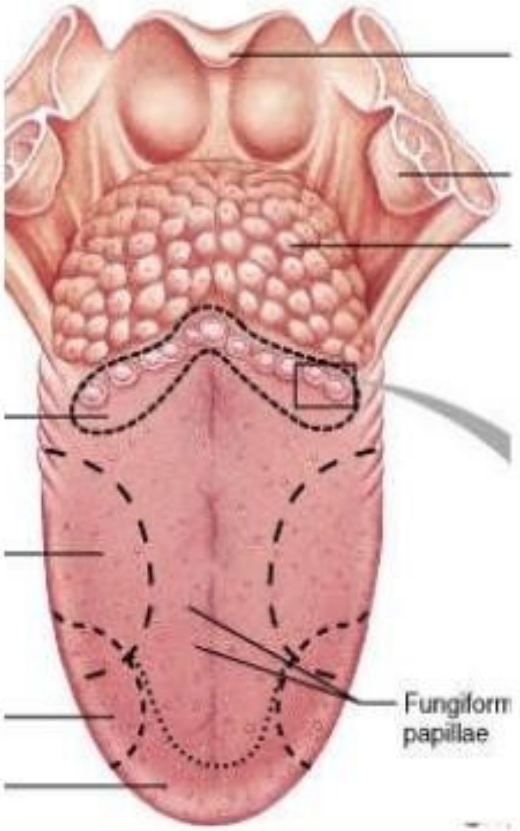
- The **oropharynx** opens into the oralcavity(mouth) and extends from the uvula to the epiglottis
- The **epiglottis** is an elastic plate of cartilage at the posterior part of the tongue

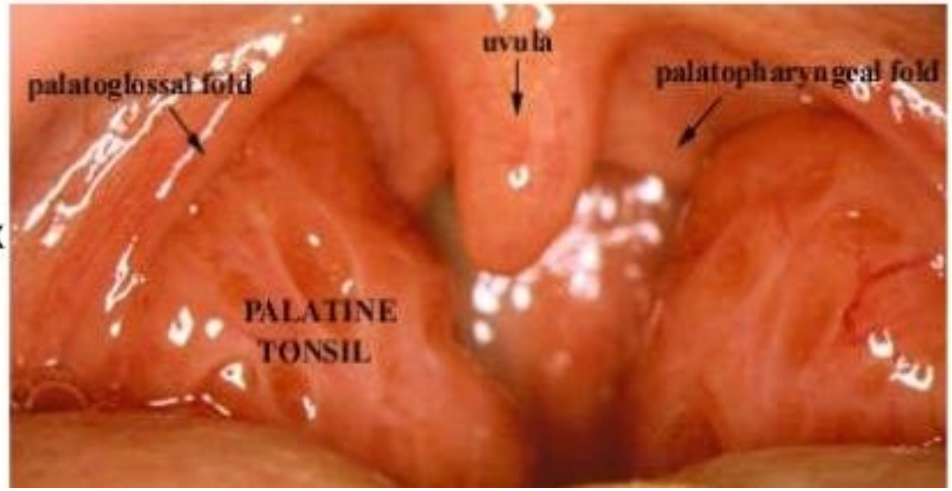


Tonsils

- Form a ring of lymphoid tissue around the entrance to the pharynx
- 3 main sets:
  - Palatine
    - Located on either side of the posterior oral cavity
    - Largest and infected most often
  - Lingual
    - Lie at the base of the tongue
  - Pharyngeal
    - Found in the posterior wall of the nasopharynx
    - Called adenoids when infected

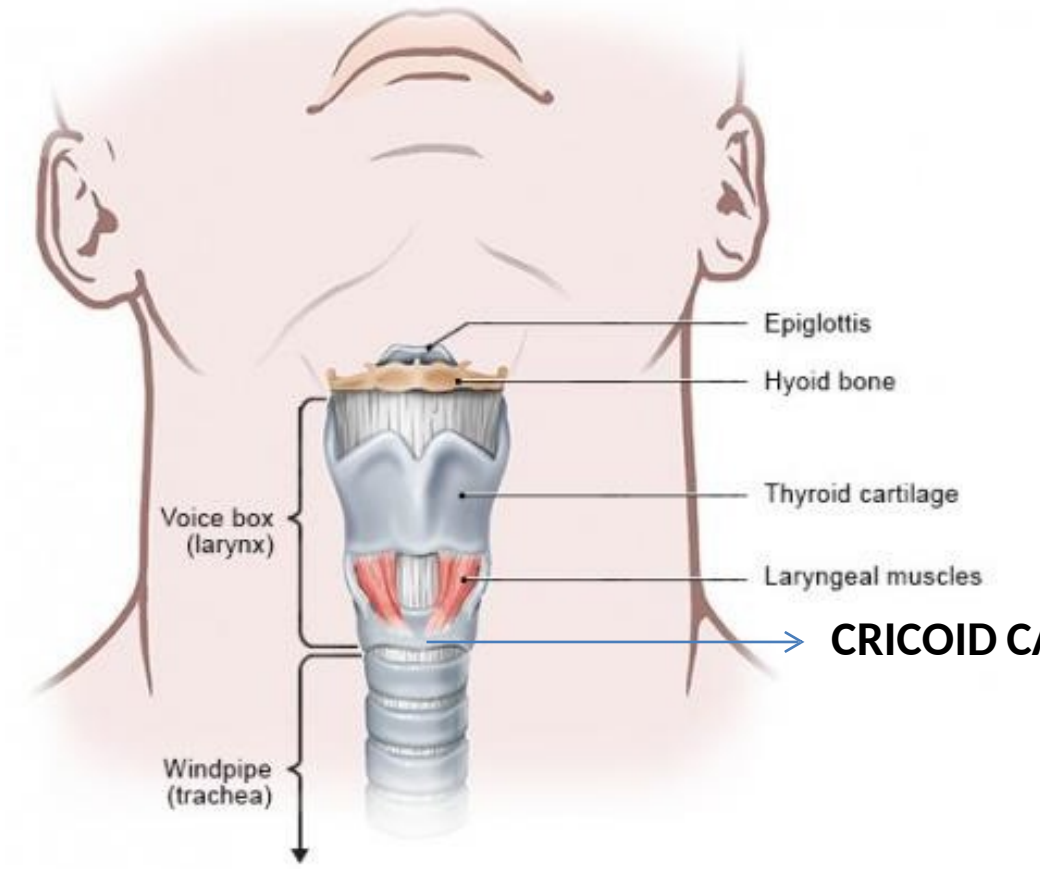




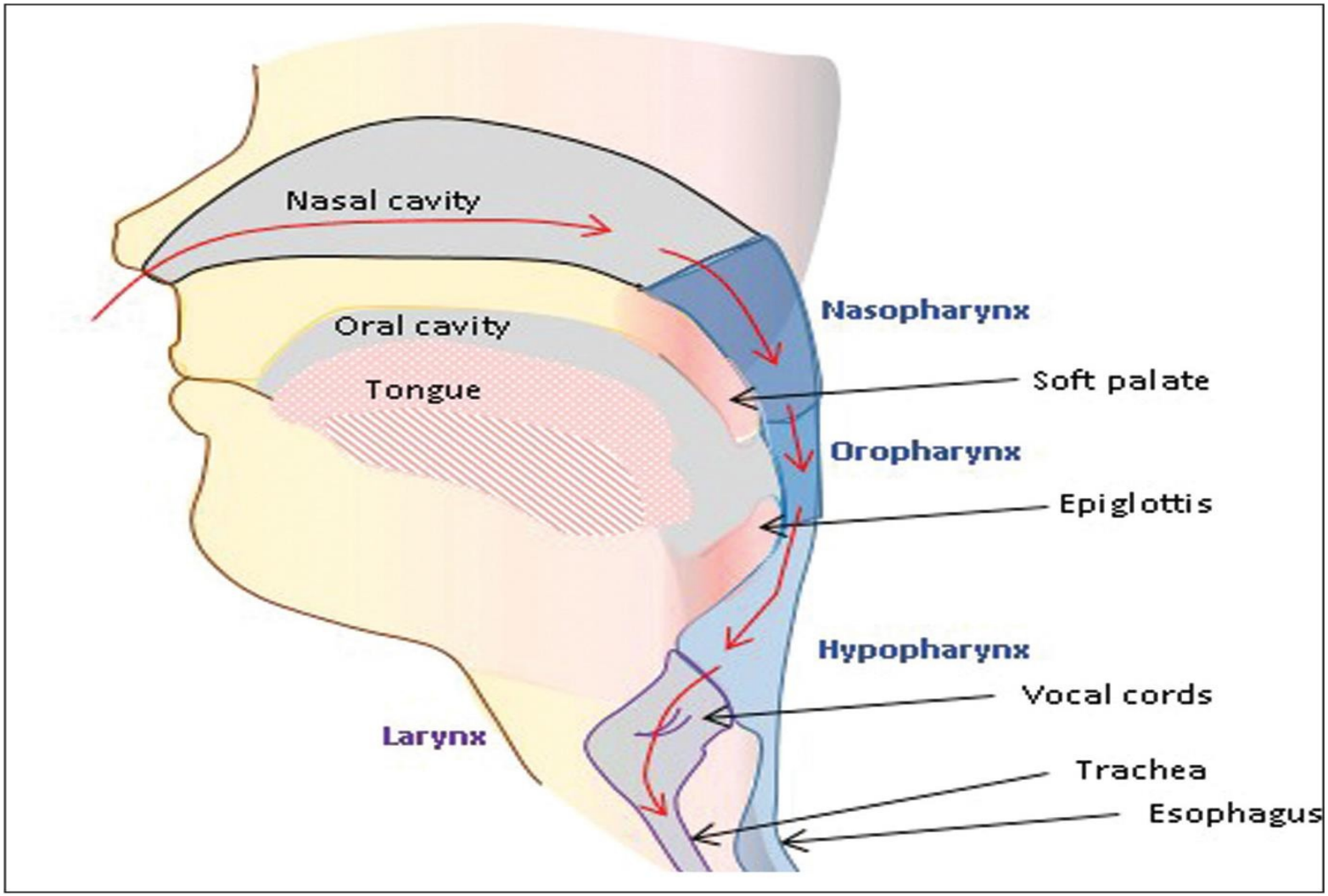


LARYNGOPHARYNX

- **Larynx** – also called voice box, consists of 9 rings of **cartilage** attached to one another by muscles and ligaments
- **The thyroid cartilage** – also called **Adam's apple** is the largest ring
- **The cricoid cartilage** is at the inferior portion of the larynx and creates a base on which the other cartilages rest
- **The vocal cords** are ligaments that pass through the larynx and vibrate when air gushes through them producing sound
- The entire vocal apparatus in the larynx is called **glottis** which contains vocal cords as well as surrounding muscles and tissues controlling it



CRICOID CARTILAGE


Nasal cavity
Oral cavity
Tongue
Nasopharynx
Soft palate
Oropharynx
Epiglottis
Hypopharynx
Vocal cords
Larynx
Trachea
Esophagus

EXAMINATION OF THE EAR

Right and left ear

- Pre auricular region
- Pinna
- Post auricular region
- External auditory canal
- Tympanic membrane
- Fistula test
- Mastoid tenderness
- Facial nerve

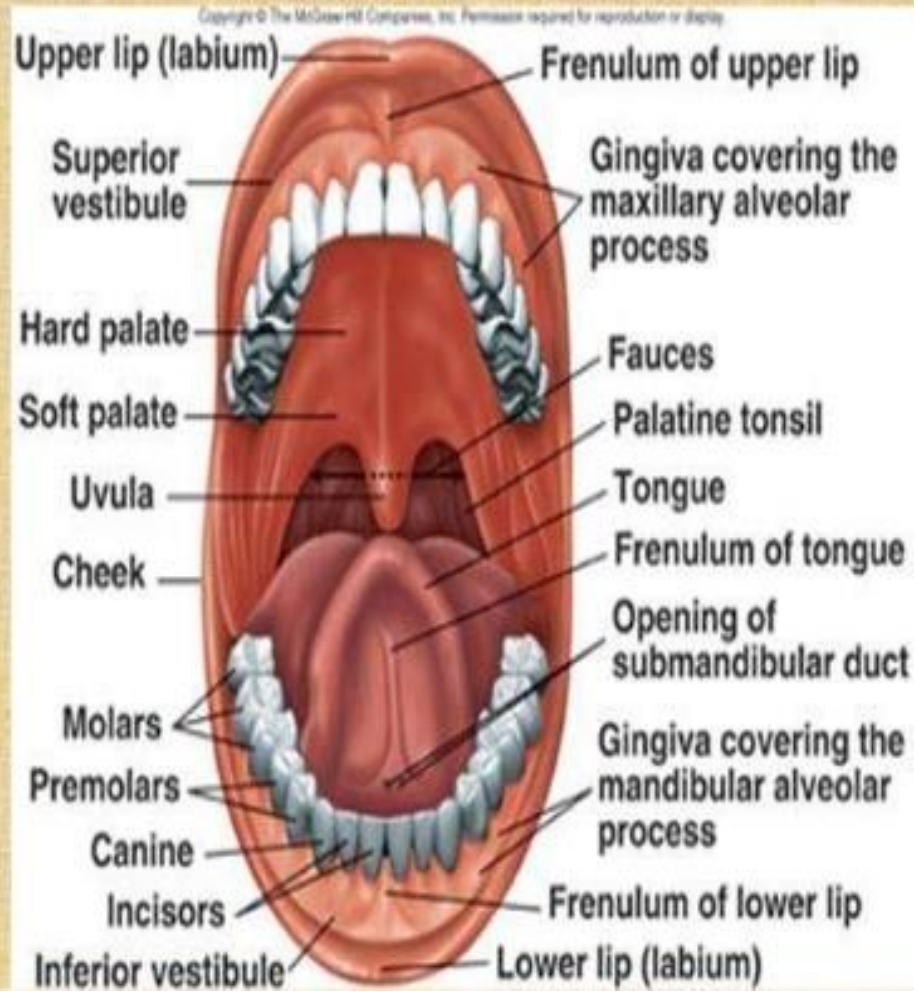
- Tunning fork tests –
- Rinne's
- Weber's
- Air bone conduction

- Tuning fork test - Test of ear conduction using a vibration source (tuning fork)
- Otoscopy - Visual examination of the ear canal with an otoscope
- Audiometry - Testing the sense of hearing.
- Ear thermometry - Measurement of the temperature of the tympanic membrane by detection of infrared radiation from the eardrum.

ORAL CAVITY & OROPHARYNX

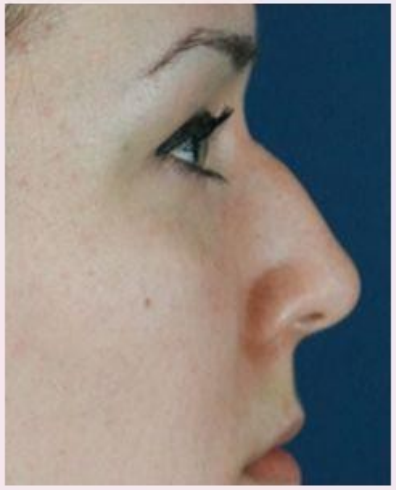
INSPECTION:

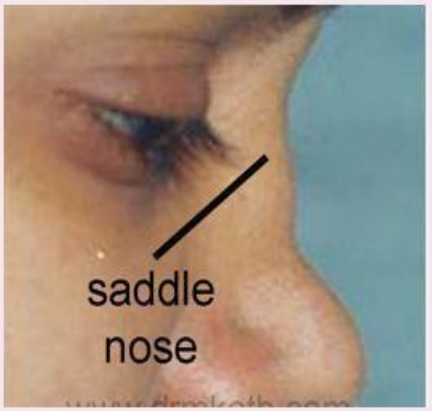
- Lips
- Teeth
- Gums
- Buccal mucosa
- Anterior 2/3 of tongue
- Floor of the mouth
- Hard palate



Examination of the nose- inspection

- Size in relation to the rest of the face
- Deviation of bridge
- Dorsum:
  - Convexity (hump)
  - Concavity (saddling) of the dorsum of the nose





PATHOLOGY

- **Acute otitis media-** inflammation in the middle ear
- **Anacusis** – deafness
- **Barotitis media-** inflammation of the middle ear caused by sudden increase in air pressure
- **Cholesteatoma** – collection of skin cells and cholesterol in a sac within the middle ear
- **Chronic otitis media-** severe infection of the ear
- **Conduction impairment** -blockage of the sound waves
- **Hearing loss-** inability to properly hear
- **Labyrinthitis** –inflammation of the inner ear leading to vertigo
- **Mastoiditis** – inflammation of the mastoid process

- **Meniere disease**-disorder of the labyrinth leading to a progressive loss of hearing
- **Myringitis/tympanitis** – inflammation of the tympanic membrane
- **Otalgia** – earache
- **Otitis externa** – inflammation of the external auditory canal
- **Otorrhea** – discharge from the ear
- **Otosclerosis** –hardening of the ear wax
- **Perforation of the ear drum** –one or more holes in the eardrum
- **Presbyacousia** – gradual loss of hearing due to aging

- **Recruitment** – abnormally large increase in perceived loudness of sound caused by a slight increase in its intensity
- **Secretory otitis media-** chronic discharge from the middle ear from unresolved otitis media
- **Vertigo** – hallucinatory sensation of spinning
- **Vestibular neuronitis** - vertigo due to inflammation of the nerve to the semi circular canal
- **Acute rhinitis** - inflammation of the nasal mucous membrane associated with viral or bacterial
- **Allergic rhinitis** - exposure to allergens like dust mites,animal dander,pollen and grasses

- **Aphtha** – small ulcer in the mucous membrane
- **Cancer of the oral cavity-** carcinoma of the mouth including cheeks,gums and tongue
- **Cancer of the paranasal sinuses** - carcinoma of the paranasal sinuses
- **Cancer of the pharynx** - any carcinoma in the connecting the nasal passage with the esophagus
- **Coryza** –involves upper respiratory tract ,also called **common cold**
- **Deviated or perforated nasal septum-** improperly aligned nasal septum
- **Epiglottitis** –inflammation of the epiglottis

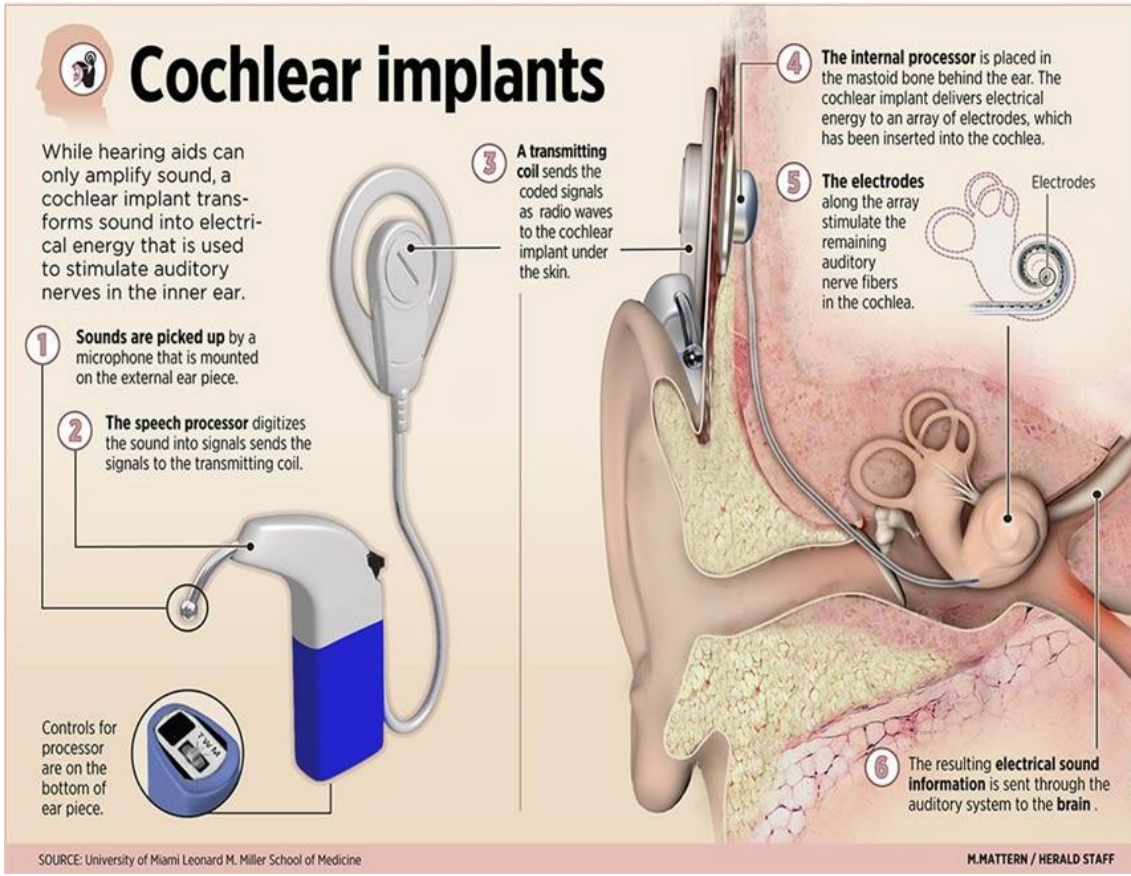
- **Epitaxis** – nosebleed
- **Gingivitis** – inflammation of the gingivae(gums)
- **Herpes simplex-** viral infection
- **Laryngitis** – inflammation of the vocal cords
- **Oropharyngeal candidiasis**-fungal infection of the mouth due to candida
- **Pharyngitis** – inflammation of the pharynx
- **Rhinitis** – inflammation of the nasal mucous membrane
- **Rhinophyma** – hypertrophy of the nose with overgrowth of the thickened sebaceous glands

- **Rhinorrhea** –discharge from the nasal mucous membrane
- **Salivary gland cancer-** carcinoma of the salivary glands
- **Seasonal allergic rhinitis(SAR**)- allergies caused by seasonal change
- **Sinusitis** – inflammation of the paranasal sinuses
- **Sleep apnea** –absence of respiration during sleep
- **Squamous cell carcinoma of the palatine tonsils**- cancer of the squammous epithelial cells in the tonsils
- **Tonsilitis** –acute inflammation of the palatine tonsils

- **Upper respiratory infection-**acute viral infection of the upper respiratory tract
- **Uvulitis** –inflammation of the uvula
- **Vincent angina-** painful bacterial infection of the soft tissues of the pharynx (ALSO CALLED TRENCH MOUTH)
- **Vocal cord nodules-**connective tissue nodules that form on the vocal cords due to chronic voice abuse
- **Vocal cord polyp-** bulging vocal cord tisssue caused by chronic laryngeal allergies,toxic reactions or by voice abuse

THERAPEUTIC PROCEDURES

- **Cochlear implant procedure** - Surgical insertion of a device that allows sensorineural hearing impaired persons to understand speech.



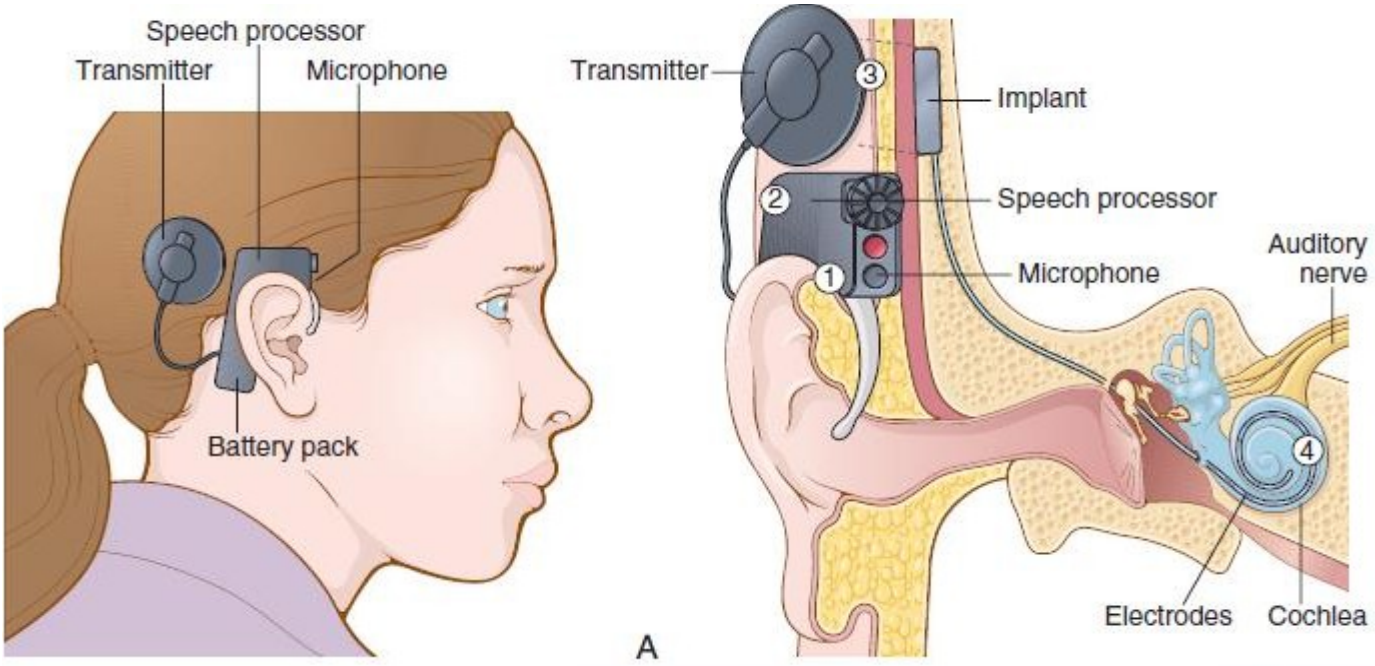


FIGURE 17-28 **A, Cochlear implant.** (1). Microphone receives sound. (2). Speech processor converts sounds into digital signals. (3). Signals are sent to a transmitter that relays them to an implant, where they are converted to electrical impulses. (4). Impulses are sent to electrodes that stimulate nerve cells in the cochlea, which sends them to the auditory nerve and brain. **B, Otoscopic examination.** The auricle is pulled up and back. The hand holding the otoscope is braced against the patient's face for stabilization.

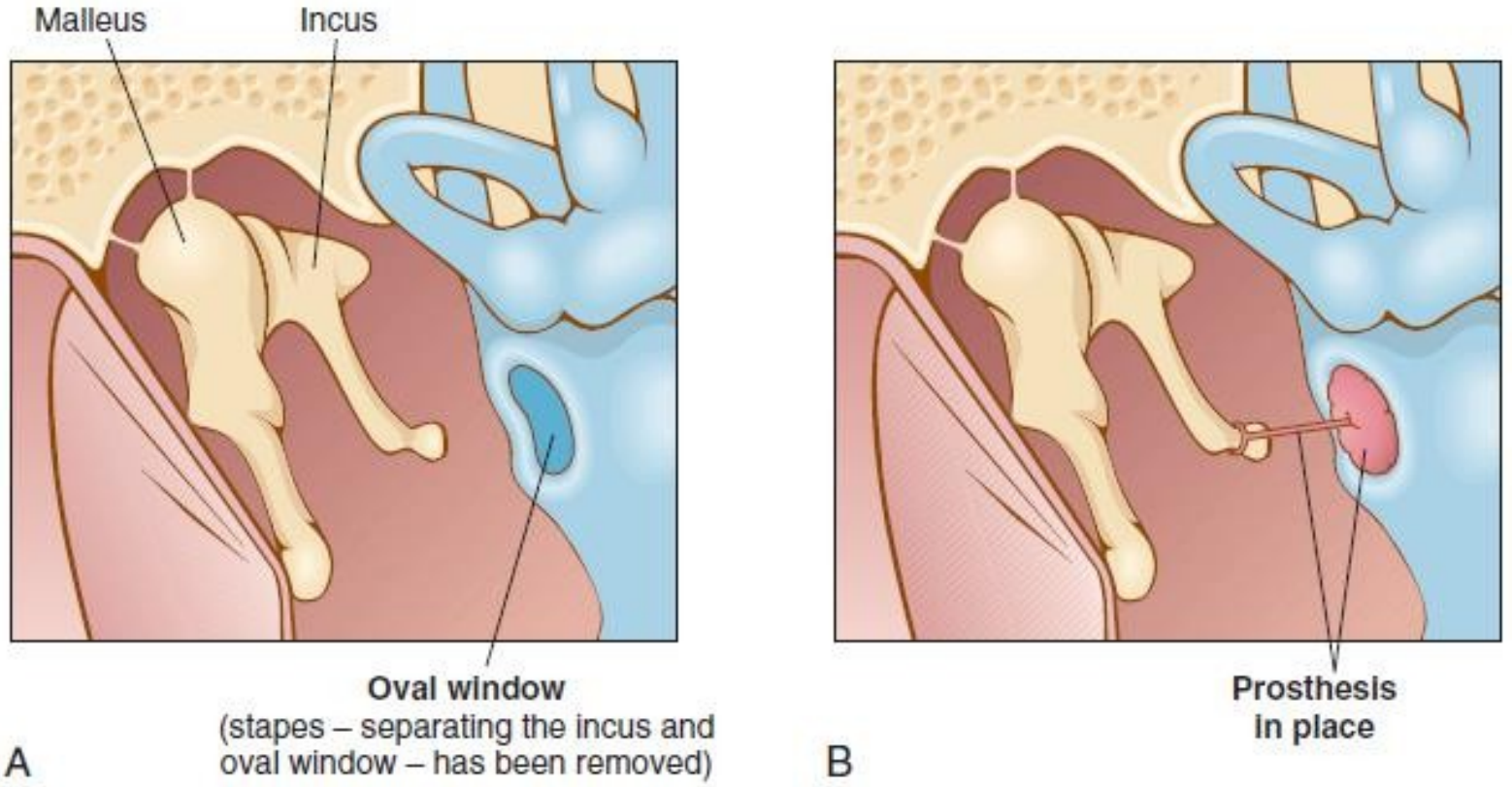


FIGURE 17-24 **A, Stapedectomy.** Using microsurgical technique and a laser, the stapes bone is removed from the middle ear. **B,** A **prosthetic device** (wire, Teflon, or metal) is placed into the incus and attached to a hole in the oval window.

THERAPEUTIC PROCEDURES

Procedure	Description
adenoidectomy	Surgically removing the pharyngeal tonsils (adenoids).
cochlear implant	Surgically implanting a microprocessor under the skin capable of converting sound into electric current. This current is transmitted to implanted electrodes in the middle or inner ear, which then stimulate the auditory division of the vestibulocochlear nerve. Cochlear implants are used to provide limited hearing for those with sensory deafness.
laryngectomy	Surgically removing the larynx.
laryngostomy	Surgically creating a permanent opening into the larynx.
myringoplasty	Surgically repairing the tympanic membrane. Also known as *tympanoplasty*.
myringotomy	Surgically puncturing the tympanic membrane and inserting a tube to allow for drainage or aspiration of fluid from the middle ear. This procedure is most commonly performed on young children. Also known as *tympanotomy*.
otoplasty	Surgically altering the shape of a deformed or excessively large or small auricle. This procedure is most commonly performed for cosmetic reasons.
palatopharyngoplasty	Surgically resecting unneeded tissue in the oropharyngeal region to treat certain types of snoring and/or sleep apnea. Also known as *uvulopalatopharyngoplasty*.
rhinoplasty	Surgically repairing a defect of the nose or altering its shape. This procedure can be performed for medical or cosmetic reasons.
septoplasty	Surgical repair of a deviated or perforated nasal septum.
stapedectomy	Removing the stapes. It may be replaced with a prosthesis. This procedure is typically done to surgically correct otosclerosis and also involves reconstruction of the oval window.
tonsillectomy	Surgically removing the palatine tonsils.

ABBREVIATIONS

ABBREVIATIONS—THE EAR

AD	right ear (Latin, *auris dextra*)	**ENT**	ears, nose, and throat
AOM	acute otitis media	**ETD**	eustachian tube dysfunction
AS	left ear (Latin, *auris sinistra*)	**HEENT**	head, eyes, ears, nose, and throat
EENT	eyes, ears, nose, and throat	**PE tube**	pressure-equalizing tube—a polyethylene ventilating tube placed in the eardrum (to treat recurrent episodes of acute otitis media)
ENG	electronystagmography—a test of the balance mechanism of the inner ear by assessing eye movements (**nystagmus** is rapidly twitching eye movements)	**SOM**	serous otitis media

ABBREVIATIONS

Abbreviation	Meaning
AC	air conduction
AD	right ear (auris dextra)
AOM	acute otitis media
AS	left ear (auris sinistra)
BC	bone conduction
C&S	culture and sensitivity
dB	decibel
EAC	external ear canal
ENT	ear, nose, throat
Hz	hertz
PE tubes	pressure-equalizing tubes
SAR	seasonal allergic rhinitis
SRT	speech reception threshold
T&A	tonsillectomy and adenoidectomy
TM	tympanic membrane
TMJ	temporomandibular joint
UPPP	uvulopalatopharyngoplasty
URI	upper respiratory infection

TERMS

Form	Meaning	Example(s)
acous/o	hearing (see also audi/o; audit/o)	acoustic
audi/o	hearing; the sense of hearing (see also acous/o; audit/o)	audiometry
audit/o	hearing (see also acous/o, audi/o)	auditory
aur/o	ear (see also auricul/o; ot/o)	auris
auricul/o	ear (see also aur/o; ot/o)	auricle, postauricular
cochle/o	cochlea	vestibulocochlear, electrocochleography
epiglott/o	epiglottis	epiglottitis
gingiv/o	gums	gingivitis
laryng/o	larynx (voice box)	laryngitis, laryngectomy
lingu/o	tongue	lingual
myring/o	eardrum (see also tympan/o)	myringoplasty, myringotomy
nas/o	nose	nasopharynx, paranasal
or/o	mouth	oral
ot/o	ear (see also aur/o; auricul/o)	otoscope, otitis
palat/o	palate	palatine
pharyng/o	throat; pharynx	oropharynx, pharyngeal
rhin/o	nose	rhinitis, rhinorrhea
sept/o	septum	septonasal, septoplasty
tonsill/o	tonsil	tonsillectomy, tonsillitis
tympan/o	eardrum (see also myring/o)	tympanic, tympanometry
uvul/o	uvula	uvulopalatopharyngoplasty, uvulitis
vestibul/o	vestibule	vestibulocochlear

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
staped/o	stapes (third bone of the middle ear)	stapedectomy _____ *After stapedectomy a prosthetic device is used to connect the incus and the oval window (Figure 17-24). Also see otosclerosis, page 723.*	
tympan/o	eardrum, tympanic membrane	tympanoplasty _____ *Surgical reconstruction of the bones of the middle ear with reconnection of the eardrum to the oval window. Figure 17-25A shows a normal tympanic membrane (eardrum).*	
vestibul/o	vestibule	vestibulocochlear _____	

SUFFIX	MEANING	TERMINOLOGY	MEANING
-acusis *or* **-cusis**	hearing	hyperacusis _____ *Abnormally acute sensitivity to sounds.*	
		presbycusis _____ *This type of nerve deafness occurs with the process of aging.*	
-meter	instrument to measure	audiometer _____	
-otia	ear condition	macrotia _____ *Abnormally large ears; congenital anomaly.*	

THANK YOU