CHAPTER

3

Diagnostic and Therapeutic Procedures in ENT

COMPETENCY

EN3.1: Observe and describe the indications for and steps involved in the performance of Otomicroscopic examination in a simulated environment.

SHORT ANSWERS

1. Enumerate the indications and advantages of otomicroscopic examination. **(2+1 marks)**

Otomicroscopic Examination

Indications

Diagnostic

Detailed examination of:

1. The external auditory canal
2. The tympanic membrane: type of perforation; retraction
3. The middle ear as visualized through the perforation: middle ear mucosa; any discharge/foreign body.

Therapeutic

1. Cleaning of discharge/debris in the external auditory canal and middle ear
2. Remove foreign bodies from the external auditory canal and middle ear
3. Intra-tympanic injections
4. Myringotomy with/without grommet insertion
5. Myringoplasty/tympanoplasty
6. Mastoid exploration.

Advantages

1. Magnified view
2. Both hands are free for any procedure
3. Can be connected to monitor for demonstration purposes
4. Procedure can be recorded for teaching and documentation purposes

2. Classify pars tensa retraction. **(3 marks)**

Retraction of Pars Tensa: Sade's Classification

1. ***Grade 1*:** Mild retraction not touching the long process of the incus
2. ***Grade 2*:** Moderate retraction touching the long process of the incus
3. ***Grade 3*:** Middle ear atelectasis. Retracted tympanic membrane touching the promontory but can be lifted from the promontory with a suction tip
4. ***Grade 4*:** Adhesive otitis media. The tympanic membrane is very thin, wraps the ossicles, and gets plastered to the promontory.

3. Classify pars flaccida retraction. **(3 marks)**

Retraction of Pars Flaccida: Tos' Classification (Fig 3.1.1)

1. ***Grade 1*:** Small attic dimple
2. ***Grade 2*:** Pars flaccida retracted maximally and draped over the neck of the malleus
3. ***Grade 3*:** As grade 2 with limited outer attic wall erosion
4. ***Grade 4*:** Severe outer attic wall erosion.

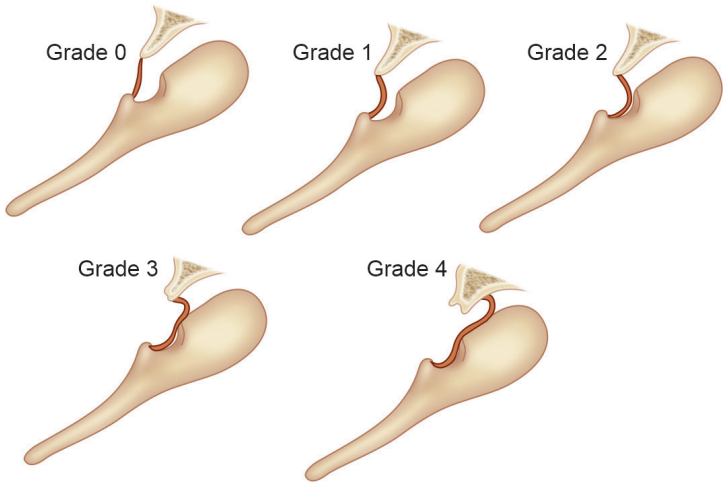

Fig. 3.1.1: Tos' classification of pars flaccida retraction

COMPETENCY

EN3.2: Observe and describe the indications for and steps involved in the performance of diagnostic nasal endoscopy.

SHORT ANSWER

1. Explain diagnostic nasal endoscopy. **(3 marks)**

Diagnostic Nasal Endoscopy

- It is a minimally invasive procedure for the examination of the nasal cavity using a rigid nasal endoscope.
- The most used instrument is the 0° Hopkins rod telescope.

Indications

1. Headache
2. Nasal obstruction
3. Nasal discharge
4. Anosmia/hyposmia
5. Epistaxis
6. CSF rhinorrhoea
7. Epiphora
8. Serous otitis media

Preparation

- The procedure is done under local anaesthesia in an outpatient setting.
- Patties soaked in 4% lignocaine with 1:1000 adrenaline are placed 15 minutes prior to the procedure for anaesthesia and decongestion.

Procedure

- It consists of three passes:
  1. *First pass*
     - The rigid nasal endoscope is gently passed along the floor of the nasal cavity between the septum and the inferior turbinate
     - The scope is advanced into the nasopharynx
     - On withdrawal, the scope is rolled into the inferior meatus
     - The following structures are examined in this pass:
       - Nasal septum
       - Inferior turbinate
       - Choana
       - Roof of nasopharynx
       - Ipsilateral Eustachian tube
       - Fossa of Rosenmüller
       - Nasolacrimal duct opening
  2. *Second pass*
     - The scope is passed up to the choana and moved upwards medial to the middle turbinate
     - The following structures are examined:
       - Superior turbinate
       - Superior meatus
       - Sphenoethmoidal recess
       - Anterior surface of the sphenoid
       - Woodruff's plexus
  3. *Third pass*
     - The scope is passed between septum and middle turbinate posteriorly
     - It is the rolled under the inferior border of the middle turbinate to enter the middle meatus

– The following structures are examined:
  - Middle turbinate
  - Agger nasi cell
  - Uncinate process
  - Bulla ethmoidalis
  - Hiatus semilunaris
  - Accessory ostia

COMPETENCY

EN3.3: Observe and describe the indications for and steps involved in the performance of rigid/flexible laryngoscopy.

SHORT ANSWERS

1. Compare and contrast rigid telescopic laryngoscopy (RTL) and flexible laryngoscopy (FL). (3 marks)

Features	*Rigid telescopic laryngoscopy*	*Flexible laryngoscopy*
Procedure	Outpatient	Outpatient
Equipment	Rigid 70 or 90° telescope	Flexible laryngoscope
Insertion	Per oral	Nasal or oral
Anaesthesia	4% Xylocaine spray to oropharynx	4% Xylocaine nasal patties and topical nasal decongestants
Areas examined	Parts of oropharynx Supraglottis Glottis Parts of hypopharynx	Nasal cavity Nasopharynx Oropharynx Supraglottis Glottis Parts of hypopharynx
Cost	Expensive	More expensive
Information obtained	Clear magnified view of larynx	Clear magnified view of larynx plus laryngeal biomechanics
Supplemental Procedures	None	Dynamic voice assessment, functional endoscopic evaluation of swallowing can be done
Cannot be performed in	Patients with trismus Unconscious patient	Not a contraindication

2. Enumerate the indications of direct laryngoscopy. (3 marks)

Direct Laryngoscopy

Indications

I. *Diagnostic*

1. Indirect laryngoscopy could not be done, e.g. in infants and young children
2. Failed indirect laryngoscopy, e.g. excessive gag reflex or overhanging epiglottis

3. To examine hidden areas
   i. *Hypopharynx*: Apex of pyriform fossa, postcricoid region
   ii. *Larynx*: Infrahyoid epiglottis, ventricles, and subglottis
4. For the extent of growth and biopsy
5. Assess laryngeal trauma
6. To assess mobility of arytenoids and diagnose cricoarytenoid joint fixation
7. As a part of panendoscopy in metastasis of unknown primary

II. *Therapeutic*

1. Removal of benign laryngeal lesion, e.g. papilloma, vocal nodule, polyp, or cyst
2. Removal of laryngeal/hypopharyngeal foreign bodies
3. Dilatation of laryngeal strictures
4. Injection of Teflon paste in vocal cords for vocal cord palsy

3. Differentiate between direct and indirect laryngoscopy. (3 marks)

Feature	*Direct laryngoscopy*	*Indirect laryngoscopy*
Location	OT	OPD
Anaesthesia	General anaesthesia	Local anaesthesia
Position	Boyce position	Sitting
Hidden area	Hidden areas can be examined	Infrahyoid surface of epiglottis Ventricle Subglottis Apex of pyriform fossa Postcricoid
Complications	Injury to surrounding structures Laryngeal oedema	Almost none
Cost of procedure	Expensive	Cheaper
Contraindications	Cervical spine diseases Trismus Stridor Aortic aneurysm Acute corrosive poisoning	Trismus Uncooperative patients Paediatric patients Severe stridor

COMPETENCY

EN3.4: Observe and describe the indications for and steps involved in the removal of foreign bodies from ear, nose and throat.
EN4.49: Elicit document and present a correct history, demonstrate and describe the clinical features, choose the correct investigations and describe the principles of management of foreign bodies in the air and food passages.

SHORT ESSAYS

1. Explain the management of foreign bodies of air passages. (5 marks)

Investigations

1. *Soft tissue neck in its extended position PA and lateral view*: To visualize the foreign body.

2. *Plain X-ray chest PA and lateral views*
   - Foreign body—size, site, shape
   - Presence of atelectasis or hyperinflation
   - Pneumomediastinum or pneumothorax
   - Pneumonitis/bronchiectasis
3. Fluoroscopy/videofluoroscopy
4. CT chest

Treatment

- *Heimlich Manoeuvre*
  - Kids: Turned upside down and back pounded
  - Adults: Rescuer stands behind with arms around patient's lower chest and gives abdominal thrusts which exert pressure on the bottom of the diaphragm. Residual air dislodges the foreign body.
- *Cricothyrotomy or emergency tracheostomy*: In failed Heimlich manoeuvre
- *Direct laryngoscopy or by laryngofissure, if impacted*: for foreign body removal
- *Bronchoscopy (rigid/lexible)*: Tracheal and bronchial foreign bodies removed using Dormia basket or Fogarty's balloon.
- *Thoracotomy and bronchotomy*: For peripheral foreign bodies.

2. Characterise foreign bodies in the ear. (5 marks)

Foreign bodies of ear can be classified as:

1. Non-living

- They can be vegetable or non-vegetable foreign body
- Children: Paper/sponge/seeds/chalk/metallic pieces
- Adult: Matchstick/cotton swab
- Vegetable foreign body has tendency to get tightly impacted or may even suppurate
- ***Symptoms*:** Pain, irritation, or deafness
- ***Methods of removing a foreign body***
  1. *Forceps removal*: For soft and irregular foreign bodies
  2. *Syringing*: For smooth objects
  3. *Suction*
  4. *Microscopic removal with special instruments*: In impacted/with previous failed attempts of removal
  5. *Postaural approach*: In foreign bodies impacted medial to the isthmus or those in the middle ear.

2. Living

- Small insects like ant, mosquitoes, cockroach or maggots
- ***Symptoms***
  - Crawling/irritable sensation
  - Noise in the ear
  - Severe pain
  - Blood-stained watery discharge

- ***Signs***
  - Oedema around the ear
  - Maggots filling the ear canal
- ***Treatment***
  - Instill 4% lignocaine into the canal to kill the living organisms
  - The dead insect can be removed by any of the above methods.
- ***Complications***
  1. Traumatic tympanic membrane perforation
  2. Vaso-vagal attack
  3. Further impaction of the foreign body
  4. Labyrinthine stimulation causing vertigo.

3. What is a rhinolith? Describe its aetiology, clinical features, and management. (5 marks)

Rhinolith

Stone formation in the nasal cavity.

Aetiology

- Chronic foreign body in the nose or thick mucus or blood clot acts as nidus on which there occurs slow deposition of calcium and magnesium salts
- A large, irregular mass, filling the nasal cavity, is formed
- It can erode the septum and/or lateral wall of nose due to pressure necrosis.

Clinical Features

- *Symptoms*
  - Unilateral nasal obstruction
  - Foul-smelling blood-stained discharge
  - Epistaxis
  - Neuralgic pain due to ulceration of the surrounding mucosa
- *Signs*
  - Anterior rhinoscopy: A greyish/blackish irregular mass seen
    On probing: Stony; brittle and has grating sensation.

Investigations

- Diagnostic nasal endoscopy
- X-ray PNS: Radio-opaque shadow in nasal cavity
- CT PNS: To rule out extension to the paranasal sinuses.

Treatment

- Direct visualization and removal through anterior nares under general anaesthesia
- Lateral rhinotomy: To remove hard and irregular ones.

Complication

Oroantral fistula.

SHORT ANSWER

1. Categorise the site of lodgement of foreign body in the air passage depending on the signs and symptoms. (5 marks)

Site	*Symptoms and signs*
Larynx	• Complete obstruction: Death • Partial obstruction: Cough, hoarseness, stridor
Trachea	• Cough, wheeze, stridor, choking, palpatory thud
Bronchi	• Triad: Cough, wheeze, and diminished air entry to the lung • Late: Emphysema, bronchiectasis, lung abscess/collapse

COMPETENCY

EN3.5: Observe and describe the indications for and steps involved in the surgical procedures in ear, nose and throat.

LONG ESSAYS

1. Discuss endoscopic sinus surgery under the following headings.
A. Indications. (3 marks)
B. Contraindications. (1 mark)
C. Steps of surgery. (4 marks)
D. Complications. (2 marks)

A. Indications

1. Nasal cavity
   i. Excision of concha bullosa
   ii. Epistaxis
   iii. Synechiae release
   iv. Surgery for inferior turbinate reduction
   v. Foreign body
   vi. Septoplasty
   vii. Benign tumour removal
   viii. Choanal atresia
   ix. CSF leak repair
2. Paranasal sinuses
   i. Chronic/recurrent bacterial sinusitis
   ii. Sinonasal polyposis
   iii. Fungal sinusitis
   iv. Mucocele
3. Orbit
   i. Orbital abscess or cellulitis management
   ii. Dacryocystorhinostomy
   iii. Optic nerve decompression
   iv. Orbital decompression

4. Miscellaneous
   i. Pituitary surgery
   ii. Vidian neurectomy
   iii. Adenoidectomy

B. Contraindications

1. Lack of required instrumentation
2. Lack of experience
3. Inaccessible disease
4. Osteomyelitis
5. Bleeding/clotting disorders

C. Steps of Surgery

Anaesthesia

- Local anaesthesia with i.v. sedation
- General anaesthesia

Position

Patient is supine with head on a head ring, slightly elevated and turned towards the operating surgeon.

Techniques

- *Anterior to posterior* (*Stammberger's technique*): From uncinate process backward to sphenoid sinus. Surgery can be tailored as per the disease extent.
- *Posterior to anterior* (*Wigand's technique*): From the sphenoid sinus and proceeds anteriorly. Performed in extensive disease or revision cases.

Steps

1. Pledgets of cotton soaked in 4% lignocaine with adrenaline are removed and the nose inspected
2. Multiple sites on the lateral wall injected submucosally with 1% lignocaine with adrenaline under endoscopic control
3. Middle turbinate medialized to identify the uncinate process and bulla ethmoidalis
4. Uncinectomy performed with sickle knife
5. Maxillary ostium identified and enlarged using backbiting and straight through-cutting forceps
6. Bullectomy done with curette or Blakesley forceps
7. Basal lamella opened in the inferomedial part and removed with Blakesley forceps
8. Posterior ethmoid cells are exenterated
9. Clearance of frontal recess and frontal sinusotomy performed to establish proper drainage
10. Sphenoidotomy is performed by:
    i. By entering the sphenoid sinus from posterior ethmoids
    ii. By enlarging the sphenoid osteum present 1 cm above the upper border of the posterior choana
11. In bilateral disease, procedure is repeated on the other side
12. Finally, the anterior nasal packs are applied.

Postoperative Care

- Nasal packs are removed 24 hours after the operation
- Antibiotics for 7–10 days by oral route
- Antihistaminics
- Analgesics
- Nasal irrigations
- Steroid nasal sprays
- Endoscopic cleaning: To remove clots, debris, crust or any adhesion
- Weekly review of the cavity till complete mucosalisation.

D. Complications

Major

1. Anosmia
2. Massive haemorrhage requiring blood transfusion
3. Injury to the internal carotid artery
4. Injury to nasolacrimal duct
5. Orbital haemorrhage
6. Loss of vision/blindness
7. Diplopia
8. CSF leak
9. Meningitis
10. Brain abscess
11. Intracranial haemorrhage
12. Direct brain trauma
13. Death

Minor

1. Periorbital ecchymosis
2. Periorbital emphysema
3. Postoperative epistaxis
4. Postoperative infection: Rhinitis or sinusitis
5. Adhesions
6. Stenosis of the maxillary or frontal sinus opening
7. Exacerbation of asthma
8. Hyposmia
9. Dental pain

2. Classify the surgical approaches to the ear. (10 marks)

Classification of Surgical Approaches

1. Transcanal approach

This approach is used when there is a wide external auditory canal with complete visualization of the perforation.

Incision (Fig. 3.5.1)

- Rosen's incision
  - It has two parts
  - Vertical incision at 12 o'clock position which meets the curvilinear incision at 6 o'clock position at the posterosuperior part of the canal.

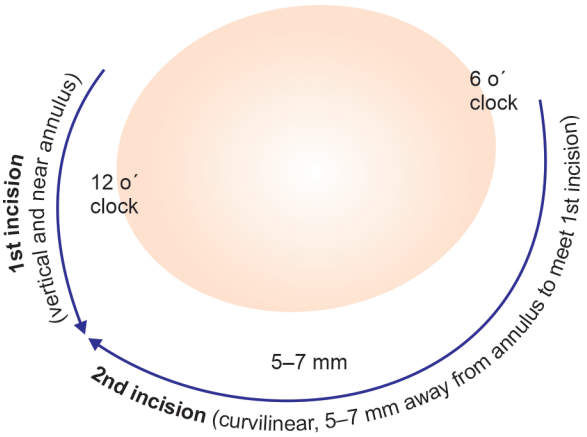

Fig. 3.5.1: Rosen's incision

Advantage

Good view of the middle ear and ossicles.

Contraindication

Anterior perforation obscured by overhanging canal wall.

Uses

1. Stapedectomy
2. Exploratory tympanotomy
3. Inlay myringoplasty
4. Ossicular reconstruction

2. *Endaural Approach*

It gives a more anterior surgical view than a transcanal approach.

Incision (Fig. 3.5.2)

Lempert's incision

- Lempert 1: Semi-circular incision made from 6 o'clock to 12 o'clock position in the posterior meatal wall at the bony cartilaginous junction.
- Lempert 2: To start from the first incision at 12 o'clock and passes upwards in a curvilinear fashion through the incisura terminalis.

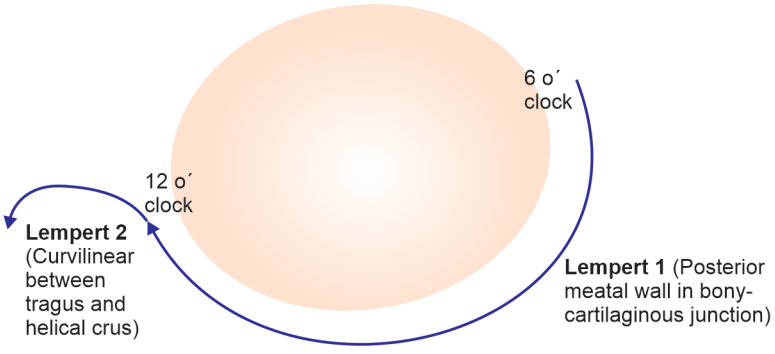

Fig. 3.5.2: Lempert's incision

Advantages

1. Better anterior surgical view compared to transcanal approach
2. Most anterior perforation may still be obscured by the anteroinferior overhang

Uses

1. Excision of osteoma or exostoses
2. Attic cholesteatoma with limited antrum extension

3. *Postaural Approach*

The reflection of the pinna and postauricular tissue and canaloplasty provide complete exposure of the anterior angle.

Incision (Fig. 3.5.3)

Wilde's incision

- Postauricularly from the highest attachment of the pinna till the tip of the mastoid, a centimetre behind the retroauricular groove.

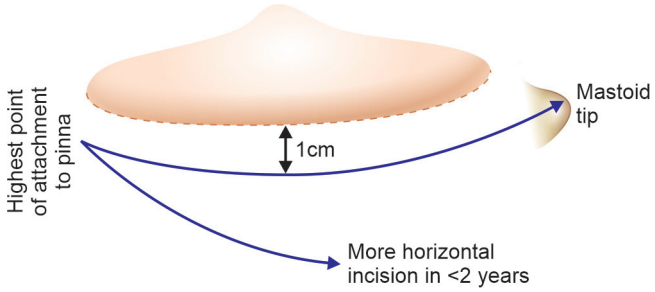

Fig. 3.5.3: Wilde's incision

Advantages

1. Better exposure
2. Incision can be extended in well-pneumatised mastoids

Uses

1. Facial nerve surgery
2. Translabyrinthine approach to acoustic neuroma
3. Canal wall down mastoidectomy
4. Mastoid cavity obliteration surgery
5. Ear canal reconstruction
6. Surgery for endolymphatic sac
7. Exposure of facial nerve in the vertical segment
8. Tympanoplasty for anterior perforation.

SHORT ESSAYS

1. Describe antral lavage under the following headings:

A. Indications. **(1 mark)**
B. Contraindications. **(1 mark)**
C. Steps. **(2 marks)**
D. Complications. **(1 mark)**

- Antral lavage is also known as a proof puncture.
- In this procedure, the maxillary sinus is irrigated by making an opening on its medial wall in the inferior meatus.

A. Indications

Diagnostic

1. Subacute and chronic maxillary sinusitis: To confirm the diagnosis
2. Collect specimens for culture and sensitivity, and cytology

Therapeutic

To wash out the pus in chronic and subacute maxillary sinusitis.

B. Contraindication

Acute maxillary sinusitis: May lead to osteomyelitis.

C. Steps

Anaesthesia

- *Adults*: Local anaesthesia using 4% lignocaine with adrenaline packs
- *Children*: General anaesthesia.

Position

- *Sitting position*: For local anaesthesia
- *Tonsillectomy position*: For general anaesthesia.

Technique

- Patient advised breathing through the mouth
- Lichtwitz trocar and cannula is introduced with direction towards the ipsilateral ear
- Puncture made on the lateral nasal wall in the inferior meatus, 1.5–2.0 cm behind the anterior end of the inferior turbinate. This point is called the genu and, the bone here is very thin and can be easily pierced.
- After removal of the trocar, the cannula is advanced till it touches the opposite antral wall.
- The cannula is slightly withdrawn, and the antrum irrigated with normal saline at body temperature using a Higginson's syringe
- Once the return fluid is clear the cannula is removed
- Temporary pack placed in the inferior meatus.

D. Complications

1. *Cheek swelling*: As a result of trocar piercing the posterior wall or soft tissues overlying the anterolateral wall of the maxilla
2. *Orbital injury/cellulitis*: If trocar pierces the roof of the antrum
3. *Bleeding*: Injury to nasal mucosa or maxillary artery
4. Air embolism.

2. Classify tympanoplasty. (5 marks)

Zollner and Wullstein's Classification (1953)

1. *Type I*

Inspection of the middle ear cleft with the closure of perforation done in case of the perforated tympanic membrane with normal ossicular chain.

2. *Type II*

- Tympanic membrane perforation with malleus erosion present
  - i. *Type IIa*: Graft placed on the incus and remnant malleus
  - ii. *Type IIb*: Malleus stapes or malleus footplate assembly
  - iii. *Type IIc*: New reconstruction independent of the malleus.

3. *Type III*

- Tympanic membrane perforation with malleus/incus erosion but intact and mobile stapes
- Also known as myringostapediopexy or columellar tympanoplasty
- Graft placed on the stapes head.

4. *Type IV*

- Only the stapes footplate present
- Also known as cavum minor or oval window tympanoplasty
- The mobile footplate kept exposed
- Graft is placed between the oval and round window creating an air pocket around the round window
- Sound waves act on the footplate and the round window is shielded.

5. *Type V*

- Fixed stapes footplate with functioning round window
- Also called fenestration operation
- A window made on lateral semi-circular canal and covered with a graft.

6. *Type VI*

- Also called sonoinversion
- The oval window is protected by a small tympanic air space extending from the Eustachian tube and the sound waves can act directly on the round window
- So, there is an inversion in the functioning of the round and oval window.

SHORT ANSWERS

1. Enumerate the contraindications of stapes surgery. (5 marks)

Contraindications of Stapes Surgery

Absolute Contraindications

1. The only hearing ear
2. Stapedial or cochlear otosclerosis with poor air-bone gap
3. Meniere's disease: Chances of sensorineural hearing loss after surgery is higher
4. Young children: Eustachian tube dysfunction can lead to the displacement of prosthesis. Reclosure of oval window due to faster otosclerotic focus growth
5. Age >70 years
6. People with professions exposed to frequent air pressure changes/noise: Higher chances of postoperative vertigo, dizziness, and sensorineural hearing loss
7. Vertigo and clinical evidence of secondary labyrinthine hydrops.

Relative Contraindications

1. Otitis externa
2. Tympanic membrane perforation
3. Exostosis
4. Pregnancy

2. Enumerate the complications of stapedectomy. (3 marks)

Complications of Stapedectomy

1. Tympanomeatal flap tear
2. Tympanic membrane perforation
3. Injury to chorda tympani/facial nerve
4. Incus dislocation
5. *Vertigo*: Intraoperative trauma, serous labyrinthitis, or long prosthesis leading to early-onset vertigo. Late-onset due to perilymph fistula and benign paroxysmal positional vertigo.
6. Perilymph fistula/granuloma
7. *CSF leak*: Due to wide cochlear aqueduct or a defect in the internal auditory canal
8. *Conductive hearing loss*: Due to short/loose/displaced prosthesis, or incus erosion
9. *Sensorineural hearing loss*: Trauma, labyrinthitis or perilymph fistula
10. Dead ear.