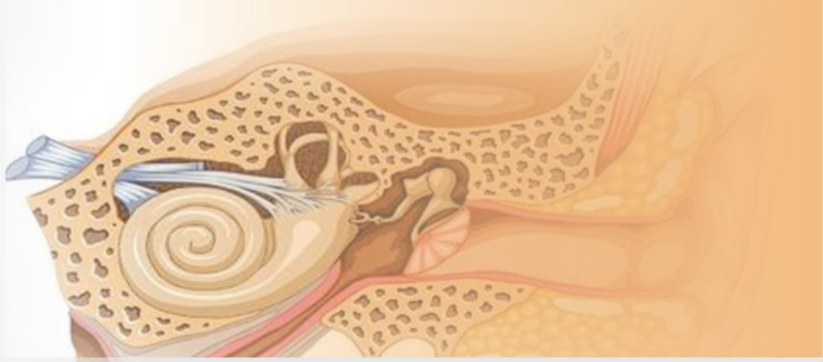

Section

I

Otology

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Chapter 1

Clinical Anatomy of Ear

CASE 1: COUGH DUE TO EAR CANAL MANIPULATION

Presenting complaints: A 62-year-old male patient came to outpatient department of otorhinolaryngology for complaints of ear blockade. On examination there was wax in the left ear. With the help of a probe, wax removal was done. Patient developed coughing during wax removal, so doctor stopped the procedure for some time.

Setting: Outpatient department.

Examination of other ear: Normal.

General examination: Blood pressure, pulse, respiratory rate are in normal range.

Q.1: What is the cause for cough during wax removal?

Ans: The posterior half of external auditory canal is get nerve supply from auricular branch of vagus nerve. Instrumentation in the posterior half of external auditory canal causes stimulation of auricular branch of vagus which is the most likely causes of cough in this patient.

Q.2: What is the other name for auricular branch of vagus?

Ans: Arnold's nerve or Alderman's nerve.

Q.3: What is the nerve supply of external auditory canal?

Ans: Anterior wall and roof by auriculotemporal nerve (V3), posterior wall and floor by auricular branch of vagus. Posterior wall of the external auditory canal also receives sensory fibres of 7th cranial nerve through auricular branch of vagus.

Q.4: What is Hitzelberger's sign?

Ans: Hypoaesthesia of posterior wall of external auditory canal. It is seen in acoustic neuroma due to involvement of sensory fibres of 7th cranial nerve.

Q.5: What is the anatomical profile of external auditory canal?

Ans: The external auditory canal is S shaped and tortuous. The canal in adults measures about 2.4 cm from the opening in the concha to the tympanic membrane. The anterior and inferior walls of the canal are longer than the posterior and superior walls. The external auditory canal can be straightened by pulling the pinna upwards, backwards and laterally in adults and downwards and backwards in children, since the bony canal in children is not developed.

Q.6: What is fissure of Santorini?

Ans: Sometimes, there is dehiscence in the cartilaginous part of the external auditory canal in the floor and anterior wall, called fissure of Santorini. It provides potential paths for infections to spread between the external auditory canal, the parotid gland and superficial mastoid region and vice versa.

Q.7: What is foramen of Huschke?

Ans: In children up to the age of 4 years and sometimes in adults, anteroinferior part of the bony meatus may present as a dehiscence, called foramen of Huschke. It permits infections to and from the parotid.

Q.8: What is nerve supply of the external auditory canal?

Ans: The anterior wall and roof were supplied by auriculotemporal nerve (V3), posterior wall and floor are supplied by auricular branch of vagus. Posterior wall of the auditory canal also receives sensory fibers of CN VII through auricular branch of vagus.

Q.9: What is Winkler's nodule?

Ans: Winkler's nodule (chondrodermatitis nodularis chronic helices) occurs on rim of the helix of pinna. It is seen in old age.

Q.10: Which is the narrowest part of the external auditory canal?

Ans: About 6 mm lateral to tympanic membrane, the bony part of the external auditory canal presents a narrowing called isthmus. Foreign body often lodged medial to the isthmus get impacted and difficult to remove. Anteroinferior portion of the bony meatus beyond the isthmus presents a recess called anterior recess which acts as a cesspool for discharge and debris in case of external and middle ear infection.

CASE 2: REFERRED OTALGIA

Presenting complaints: A 45-year-old male complains right ear pain since last 6 months.

Setting: Outpatient department.

On examination: Both ears are found to be normal.

Examiantion of the oral cavity: Right side second molar shows carious tooth.

General examination: Blood pressure, pulse and respiratory rate are in normal range.

Q.1: What is this condition?

Ans: Patient complaining of ear pain with normal examination of ear suggests referred otalgia.

Q.2: What is the next step to find out the cause?

Ans: Careful examination of oral cavity, oropharynx and temporomandibular joint is required in all cases with pain in the ear. Pain in ear may be presenting symptoms of carcinoma of oropharynx or carcinoma of larynx. This is because of carcinoma of the common neural innervations.

Q.3: What are the anatomical areas must be examined in referred otalgia?

Ans: 5T: Tonsil, **T**ooth, **T**ongue, **T**emporomandibular joint and **T**hroat (pharynx and larynx).

Q.4: What are common nerve supply of ear and other organs?

Ans:

Ear	*Other organs*
External ear (auriculotemporal nerve)	TM joint (auriculotemporal nerve), oral cavity (lingual nerve), tooth (lingual nerve)
External ear (auricular branch of vagus)	Larynx (superior and recurrent laryngeal nerve)
Middle ear (glossopharyngeal nerve—tympanic plexus)	Oropharynx sensory innervation

Q.5: What are the causes of otalgia?

Ans:

Local causes of otalgia	*Referred causes of otalgia*
1. Otitis externa, furunculosis in external auditory canal, perichondritis, etc. 2. Impacted hard wax. 3. Impacted foreign body in ear canal. 4. Herpetic zoster oticus. 5. Myringitis and traumatic perforation of ear drum. 6. ASOM, acute mastoiditis. 7. CSOM with impending complications. 8. Malignancy of external and middle ear. 9. Barotraumatic otitis media.	1. Dental lesions: Impacted wisdom tooth, caries tooth, apical tooth abscess, gingivitis, etc. 2. Tongue lesions: Ulcer, glossitis, malignancy, etc. 3. Tonsillar lesions: Acute tonsillitis, quinsy, malignancy, etc. 4. Lesions in floor of mouth: Ulcer, malignancy. 5. Lesions of pharynx: Ulcers, malignancy, foreign body. 6. Laryngeal lesions 7. Temporomandibular arthralgia. 8. Sinonasal diseases. 9. Cervical spine lesions, neck lesions, etc.

Q.6: What are the differential diagnosis of referred otalgia?

Ans:

Via 5th Cranial Nerve

- Sinusitis
- Nasopharyngitis
- Nasopharyngeal malignancy
- Carious tooth
- Costen syndrome
- Deviated nasal septum

Via 2nd and 3rd Cervical Nerves

- Arthritis
- Cervical disc lesions
- Temporomandibular joint diseases

- Fibrositis of sternomastoid muscle
- Herpetic lesions

Via 9th and 10th Cranial Nerves

- Acute tonsillitis
- Retropharyngeal abscess
- Post-tonsillectomy
- Laryngopharyngeal lesions
- Glossopharyngeal neuralgia
- Styloid process neuralgia

Via 7th Nerve

- Herpes zoster oticus

CASE 3: ENDAURAL INCISION

Presenting features: An otolaryngologist planned for tympanoplasty with an endaural incision. At which part of the pinna, the surgeon will prefer to make an incision?

Ans: Incisura terminalis.

Q.1: Where the incisura terminalis present?

Ans: The area between the tragus and crus of the helix called incisura terminalis. There is no cartilage in incisura terminalis. Incision at incisura terminalis will not cut through the cartilage and is used in endaural approach in surgery of the middle ear, mastoid and external auditory canal.

Q.2: How cartilage framework of pinna is formed?

Ans: The entire pinna except its lobule and incisura terminalis is made up of yellow elastic cartilage. Cartilage from the tragus or concha used for reconstructive surgery of middle ear. Sometimes conchal cartilage is used to correct the depressed nose.

Q.3: What is the Rosen's incision?

Ans: It is the incision used to raise the tympanomeatal flap in order to expose the middle ear in case of endomeatal or transcanal approach. Rosen's incision is the most commonly used for stapedotomy. It need the meatus and canal to be wide enough to work. It consists of two parts: A small vertical incision at 12 o'clock position near the annulus and a curvilinear incision starting at 6 o'clock position to meet the first incision in the posterosuperior region of the canal, 5–7 mm away from the annulus. This incision is also used for exploratory tympanotomy to find the cause for conductive hearing loss, inlay myringoplasty or ossicular reconstruction.

Q.4: What is MacEwen's triangle?

Ans: It is bounded by temporal line, posterosuperior segment of bony external auditory canal and the line drawn as a tangent to the external auditory canal (Fig. 1.1). It is an important landmark to locate the mastoid antrum in mastoid surgery. The mastoid antrum is situated about 1.5 cm deeper to this triangle.

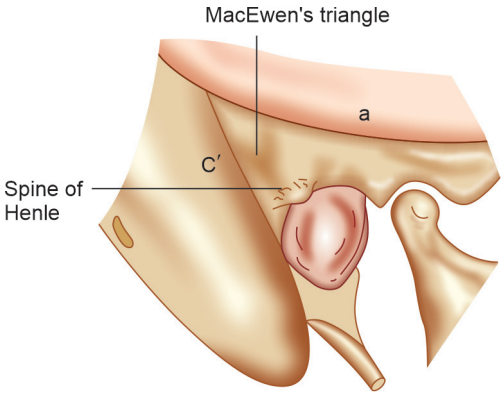


Fig. 1.1: MacEwen's triangle

Q.5: What is postaural incision?

Ans: It is also called Wilde's incision. Postaural incision starts at the highest attachment of the pinna, follows the curve of postauricular groove, lying 1 cm behind it and ends at the mastoid tip. In case of infants or children up to 2 years of age , the mastoid process is not developed and the facial nerve lies exposed near its exit and the incision therefore is slanting posteriorly, avoiding lower part of the mastoid. Postauricular incision is use for cortical mastoidectomy, modified radical mastoidectomy, radical mastoidectomy, tympanoplasty, exposure of facial nerve in vertical segment and surgery of endolymphatic sac for treatment of Meniere's disease.

CASE 4: PREAURICULAR SINUS

Presenting complaint: The parents brought their 5-year-old child to ENT OPD and complained a small dimple or punctum anterior to the right tragus.

Setting: Outpatient department

History of presenting illness: A 5-year-old child apparently well but presenting a pit infront of right tragus since birth. There were two three episodes of abscess formation in front of right pinna.

History of past illness: There were history of three times incision and drainage of the abscess infront right tragus.

General physical examination: The patient is well oriented in time, place and person. Pulse—78/min, blood pressure—122/80 mmHg.

Local examination: A small pit infront of right tragus (Fig. 1.2). Left pinna and right pinna are normal anatomical configuration.

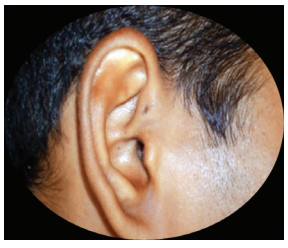


Fig. 1.2: A pit infront of tragus

Q.1: What is the diagnosis?

Ans: Right side preauricular sinus.

Q.2: What is preauricular sinus?

Ans: It is a congenital sinus infront of tragus of the pinna since birth and is due to incomplete fusion of the hillocks of His between first and second branchial arches. It is usually located between the tragus and the crus of helix.

Q.3: What is the embryological importance of preauricular sinus?

Ans: The pinna develops from the fusion of the six tubercles. These six tubercles fuse together to form the pinna (six hillocks of His). Tragus develops from the tubercle of first arch while rest of the pinna develops from the remaining five tubercles of the second arch. Faulty fusion between the first and the second arch tubercles causes preauricular sinus.

Q.4: What is the treatment of preauricular sinus?

Ans: Complete excision of the entire sinus and its ramification. Sinus can be delineated by injecting methylene blue. In case patient present with abscess, incision and drainage by vertical incision was made first. After healing, complete excision of the preauricular sinus is made.

Q.5: What is bat ear?

Ans: It is an abnormally protruding ear where the concha is large with poorly developed antihelix and scapha.

CASE 5: TYMPANIC MEMBRANE

Presenting complaints: An adult patient came to outpatent department of ENT for ear examination before medical fitness check up in the defence recruitment board.

Examination: Examination of ear, nose and throat are within normal limit. Both sides tympanic membranes are normal.

Q.1: During otoscopy, the most reliable sign over tympanic membrane is?

Ans: Lateral process of malleus. The short/lateral process of the malleus is least obliterated by diseases.

Q.2: For viewing the tympanic membrane properly, the pinna should be pulled in which direction?

Ans: Pinna is pulled backwards and upwards in adult. The pinna is pulled downwards and outwards in infants.

Q.3: What is the normal color of the tympanic membrane?

Ans: The tympanic membrane appears as a greyish white, translucent membrane set obliquely inside the external auditory canal.

Q.4: What is the clinical importance of anterior and posterior malleolar folds?

Ans: Anterior and posterior malleolar folds separate the pars tensa from pars flaccida.

Q.5: What is cone of light?

Ans: Cone of light is seen in anteroinferior quadrant of the tympanic membrane and it is actually the reflection of the light projected into the ear canal to examine it. The anteroinferior quadrant of the tympanic membrane is the only part of the tympanic membrane which is right angle to the meatus, so it reflects the exposed light. The handle of malleus causes tenting and because of tenting the anteroinferior quadrant is at right angles to the meatus and thus reflects the light which results in cone of light.

Q.6: What is the surface area of the tympanic membrane?

Ans: Area of tympanic membrane is 90 mm^2. The effective vibrating area of the tympanic membrane is 55 mm^2. Thickness of the tympanic membrane is 0.1 mm. Tympanic membrane is 9–10 mm tall and 8–9 mm wide.

CASE 6: MACEWEN'S TRIANGLE

Presenting complaints: A person was presenting with right ear discharge since 3 years and decreased hearing since 6 months. The discharge was non-foul smelling, non-blood stained and profuse.

Examination: There is large cental perforation in the right tympanic membrane. No active discharge is found during otoscopic examination of the ear.

Q.1: If patient is planned for right cortical mastoidectomy and type-1 tympanoplasty, what is the surgical landmark for cortical mastoidectomy.

Ans: MacEwen's triangle or suprameatal triangle.

Q.2: What is the boundary of the MacEwen's triangle?

Ans: It is bounded above by suprameatal line, anteroinferiorly by posterosuperior margin of external auditory canal and posteriorly by a tangent drawn from zygomatic arch.

Q.3: What is Korner's septum?

Ans: Mastoid develops from squamous and petrous bone. Korner's septum is persistence of petrosquamous suture in the form of a bony plate. Korner's septum is surgically important as it may cause difficulty in locating the antrum and the deeper cells and thus results in incomplete removal of disease during mastoidectomy. Mastoid antrum cannot be reached unless the Korner's septum has been removed.

Q.4: What are the types of mastoid bone?

Ans: There are three types of the mastoid bone such as: Pneumatised/cellular (80%), sclerotic (20%) and diploic. Pneumatisation begins in first year and is complete by 4 to 6 years of age.

Q.5: What is Trautmann's triangle?

Ans:It is bounded by sigmoid sinus posteriorly, bony labyrinth anteriorly and superior petrosal sinus superiorly.

CASE.7: STAPEDIAL REFLEX

Presenting complaints: A 22-year-old boy attended the ENT OPD with presentation of sudden right side facial paralysis with intolerance to loud noise since 2 days. He had history exposure to severe cold. He had no hearing loss, tinnitus and vertigo.

Examination: Right side lower motor neuron facial nerve paralysis (Bell's pasly). Bilateral pinna, external auditory canal and tympanic membrane were within normal limits.

Q.1: What is the cause of intolerance to loud noise in this patient with right side Bell's palsy?

Ans: Lesion of the facial nerve above the nerve of stapedius cause loss of stapedial reflex which result in hyperacusis or phonophobia, i.e. intolerance to loud sound.

Q.2: What is the role of stapedius muscle for preventing hyperacusis?

Ans: Stapedius muscle attaches to the neck of stapes and helps in dampen very loud sounds thus preventing noise trauma to the inner ear. Stapedius is a second arch muscle and is supplied by a branch of CN VII. Paralysis of the stapedius muscle results in intolerance to loud noise or hyperacusis.

Q.3: What is stapedial reflex

Ans: When loud sound 70–100 decibel above the threshold of hearing is exposed to a particular ear, cause bilateral contraction of the stapedial muscles.

Ipsilateral: CN VIII—ventral cochlear nucleus—CN VII nucleus—ipsilateral stapedius muscle.

Contralateral: VIII—ventral cochlear nucleus—contralateral medial superior olivary nucleus—contralateral CN VII nucleus—contralateral stapedius muscle.

CASE 8: FACIAL RECESS

Presenting complaints: A 3-year-old boy underwent cochlear implant for bilateral profound hearing loss. The electrodes of the cochlear implant is inserted into the round window via posterior tympanotomy approach.

Q.1: Through which recess, the electrode is inserted by posterior tympanotomy approach?

Ans: Facial recess.

Q.2: What is facial recess?

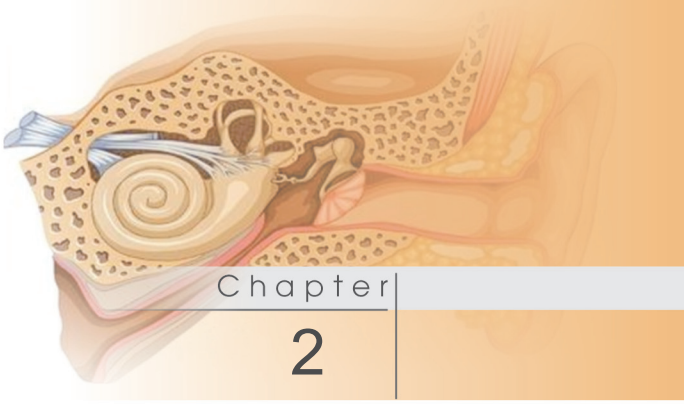
Ans: Facial recess is also called suprapyramidal recess where collection of air cells lying lateral to the facial nerve. It is bounded medially by facial nerve, laterally by chorda tympani nerve and superiorly by fossa incudes.

Q.3: What is the surgical importance of the facial recess?

Ans: Importance of this recess is that one can approach the middle ear without disturbing posterior meatal wall. This approach is used in case of cochlear implant and facial nerve decompression.

Q.4: What is fossa incudes?

Ans: Fossa incudes lies in epitympanic recess and contains short process of incus.



Chapter 2

Diseases of External Ear

CASE 1: OTITIS EXTERNA

Presenting complaints: A 25-year-old boy presents with a painful left ear since 3 days.

Setting: Out patient department.

Examination of pinna and external auditory canal: On examination, reveals a swollen lesion in the external auditory canal (Fig. 2.1). The pain is severe and worsened by traction of tragus and jaw movement.

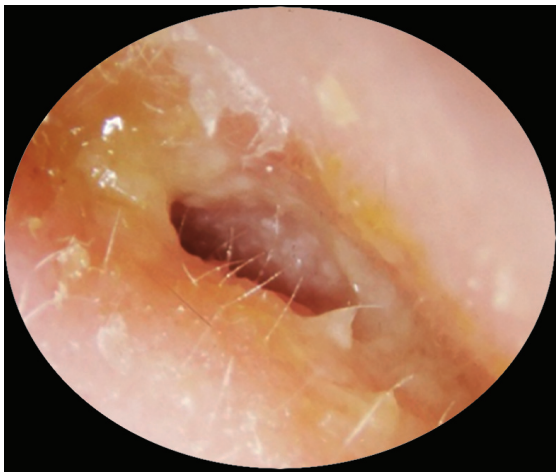


Fig. 2.1: Otitis externa

Past history: History of injury to external auditory canal one week back.

Facial nerve examination: Normal.

Q.1: Most probable diagnosis?

Ans: Otitis externa. Otitis externa is inflammation of the external auditory canal. It may be localized (furuncle) or diffuse.

Q.2: What are the common organisms responsible for otitis externa?

Ans: *Staphylococcus aureus, Pseudomonas pyocyaneus, Bacillus proteus* and *Escherichia coli*. Often the infection is mixed.

Q.3: What is the commonest cause of facial palsy at birth?

Ans: Facial palsy at birth is more often traumatic rather than developmental. Birth trauma like forceps delivery or prolonged and difficult labor can result in injury to facial nerve.

Q.4: What is the commonest congenital malformation of temporal bone?

Ans: Dehiscent fallopian canal (facial nerve canal) where facial nerve has no bony covering.

Q.5: What is the investigation of choice for congenital malformation of the ear?

Ans: Investigation of choice for congenital malformations of the ear is HRCT.

CASE 11: PATULOUS EUSTACHIAN TUBE

Presenting complaints: During third trimester of pregagncy, a 32-year-old lady complained with aware about her own sounds.

Otoscopy examination: Movement of tympanic membrane which synchronous with respiration. The movement of the tympanic membrane is exaggerated when patient breathes only through the ipsilateral side of nose.

Q.1. What is the possible diagnosis?

Ans: Patulous eustachian tube.

Q.2: What is eustachian tube?

Ans: Eustachian tube provides communication between middle ear and nasopharynx and is 36 mm in length. Its lateral one-third is bony and medial two-thirds are cartilaginous. It remains closed at rest. The opening of the tube, which is an active process, occurs due to contraction of tensor veli palatini muscle while closure occurs due to recoil of the cartilaginous part.

Q.3: What is Gerlach tonsil?

Ans: This is lymphoid tissue of the eustachian tube. This is also called tubal tonsil.

Q.4: What is Frenzel maneuver?

Ans: It opens the eustachian tube and ventilates the middle ear. The muscles of the floor of mouth and pharynx are contracted while nose, mouth and glottis are closed. In comparision to Valsalva maneuver, it is difficult to learn.

Q.5: What is Ostmann's pad of fat?

Ans: It keeps the eustachian tube closed and is related laterally to the membranous part of the cartilaginous tube. The closed tube protects itself and middle ear from the reflux of nasopharyngeal secretions.

Chapter 2

Diseases of External Ear

CASE 1: OTITIS EXTERNA

Presenting complaints: A 25-year-old boy presents with a painful left ear since 3 days.

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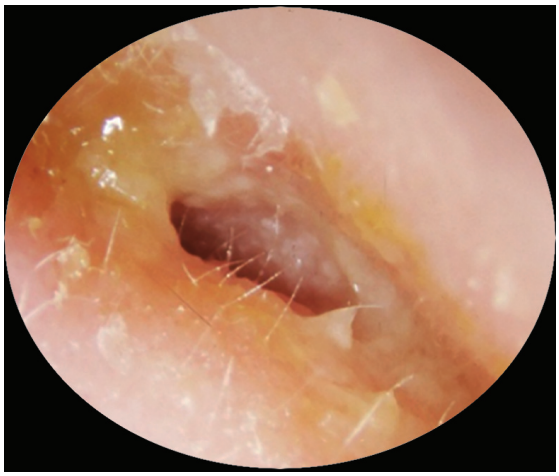
Examination of pinna and external auditory canal: On examination, reveals a swollen lesion in the external auditory canal (Fig. 2.1). The pain is severe and worsened by traction of tragus and jaw movement.



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Past history: History of injury to external auditory canal one week back.

Facial nerve examination: Normal.

Q.1: Most probable diagnosis?

Ans: Otitis externa. Otitis externa is inflammation of the external auditory canal. It may be localized (furuncle) or diffuse.

Q.2: What are the common organisms responsible for otitis externa?

Ans: *Staphylococcus aureus, Pseudomonas pyocyaneus, Baciilus proteus* and *Escherichia coli*. Often the infection is mixed.

Q.3: What are the predisposing factors for otitis externa?

Ans: Trauma (self cleaning habit with ear buds and match sticks), narrow external auditory canal, diabetic, swimming, keratosis obturans, environmental (Singapore ear, Hongkong ear).

Q.4: What is the treatment of otitis externa?

Ans: Ear toileting or mopping or suction of ear canal will clean purulent discharge. Packing ear canal with 10% ichthammol in glycerine on a ribbon gauze relieves edema, tension and pain. Broad spectrum antibiotics. Analgesics and antipyretics for relief of pain and fever.

Q.5: How furuncle of the external auditory canal differs from mastoiditis?

Ans:

Furuncle	*Mastoiditis*
1. There is no history of otorrhea	History of otorrhea
2. Not associated with hearing loss	Associated with hearing loss
3. Otalgia—more acute	Less
4. Purulent ear discharge	Discharge is mucoid or mucopurulent
5. Tragal sign positive-tragal tenderness on pressure.	Negative
6. Canal stenosis (cartilaginous part only).	Posterior bony meatal wall may be bulged.
7. Normal and intact tympanic membrane.	Perforation of tympanic membrane.
8. No tenderness over mastoid.	Tenderness over mastoid present.
9. Postauricular groove-obliterated.	Deepened postauricular groove.
10. Normal hearing.	Usually associated with conductive hearing loss.
11. No radiological changes in mastoid.	Imaging shows bone erosion in mastoid.

Q.6: What is mastoidism?

Ans: Presence of mastoid tenderness without mastoiditis is called mastoidism. It occurs in acute suppurative otitis media and is due to the fact that mucus lining of middle ear and mastoid are in continuity through aditus.

Q.7. What is the position of pinna in furunculosis of external auditory canal?

Ans: Pinna is forward and outward in furunculosis while forward and downward in mastoid abscess (erection of pinna).

Q.8: What are palpatory findings of pinna in different ear infections?

Ans:

- Tenderness at the mastoid process and the cymba conchae signifies mastoiditis. Suprameatal triangle lies under the cymba cocnhae and can be felt through it. The mastoid antrum lies deep to the suprameatal/MacEwen's triangle.
- Tenderness of tragus indicates furunculosis at the anterior wall of external auditory canal.
- Tenderness of pinna indicates perichondritis.

CASE 2: OTOMYCOSIS

Presenting complaints: A 60-year-old man presents with right side ear pain, itching, block sensation in the same ear and discharge since 15 days.

Setting: OPD.

Examination of right side external ear: The external auditory meatus is oedematous and the canal is stenosed (Fig. 2.2). The discharge is white and creamy in nature. The discharge appears as wet newspaper.

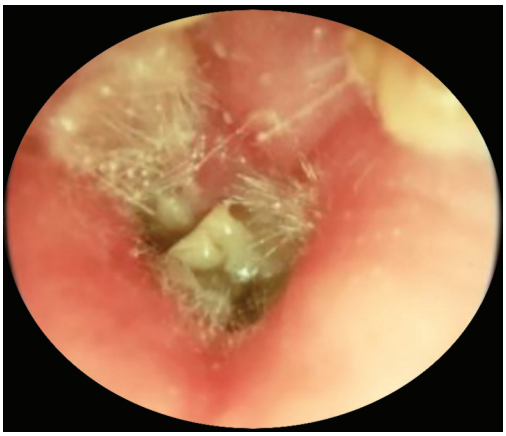


Fig. 2.2: Otomycosis

Examination of the other ear: Normal.

Examination of nose and paranasal sinuses: Normal.

Q.1: Most probable diagnosis?

Ans: Right side otomycosis.

Q.2: What is otomycosis?

Ans: It is a fungal infection of the external auditory canal, caused by *Aspergillus niger*, *Aspergillus fumigates* or *Candida albicans*.

Q.3: What are the clinical features in otomycosis?

Ans: It is commonly seen during the hot and humid months of the ear. Common symptoms are irritation, itching and dull pain in the ear. In some patients there may be discharge, sense of blockage or having heaviness in the ear. Hearing loss is uncommon unless blocked by mycotic plug. The external auditory canal is filled up by wet debris or flakes resembling wet newspaper or blotting paper with blackish areas. In some cases, grayish-white or grayish-black cotton wool like mass lies in the deeper part of the canal.

Q.4: What is the treatment of otomycosis?

Ans: Thorough aural toileting for removal of ear discharge and fungal debris. It is ideally done by suction cleaning and in some cases by syringing. Topical application of antifungal ear drops are effective against the fungus.

CASE 3: RAMSAY HUNT SYNDROME

Presenting complaints: A 50-year-old lady presented with left sided hearing loss and a painful ear. She has feeling of giddiness.

Setting: Outpatient department.

Examination of ear: Vesicular eruptions over skin in front of the right ear (Fig. 2.3). Normal tympanic membrane.

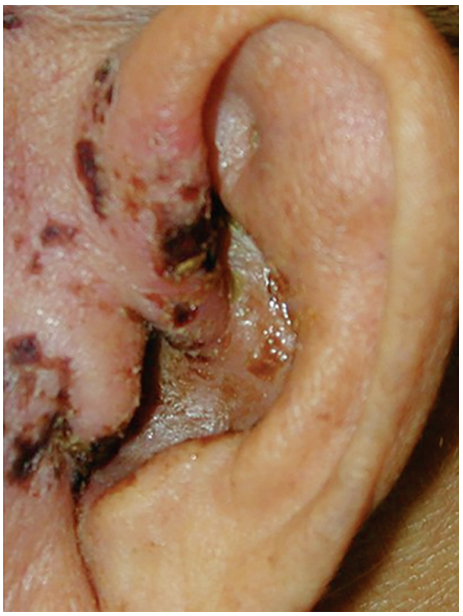


Fig. 2.3: Vesicular eruptions in Ramsay Hunt syndrome

Facial nerve examination: Left side lower motor nerve palsy.

Examination of nose and sinus: Normal.

General examination: Normal.

Q.1: What is the most possible diagnosis?

Ans: Ramsay Hunt syndrome. It is also called herpes zoster oticus. It was first described by Hunt James in 1907.

Q.2: What are the clinical presentations of Ramsay Hunt syndrome?

Ans: It is characterized by formation of vesicles on the tympanic membrane, meatal skin, concha and postauricular groove. The VIIth and VIIIth cranial nerves may be involved. In its severe form, there may be sensorineural hearing loss and disturbed vestibular function and even signs and symptoms of viral encephalitis.

Q.3: What are the cranial nerves involved in Ramsay Hunt syndrome?

Ans: Cranial nerves V, IX, and X in addition to VIIth and VIIIth cranial nerves may also be involved. It is caused by chickenpox causing virus varicella, which affects geniculate ganglion.

Q.4: What are the treatments of Ramsay Hunt syndrome?

Ans: Antiviral drugs such as acyclovir in the form of tablets 800 mg 4–5 times a day and cream. Corticosteroids in the form of tablet and cream. Antibiotics are given to prevent secondary infection. Anti-inflammatory drugs can be added. Facial nerve palsy is also managed by facial exercises.

CASE 4: OSTEOMA

Presenting complaints: A 21-year-old boy complaining decreasing hearing in right ear and block sensation in the same ear since one year.

Setting: Out patient department.

On examination: A localized smooth, slow growing bony swelling at the external auditory canal (Fig. 2.4).

General examinations: Blood pressure, pulse and other vitals of the patient were within normal limits.

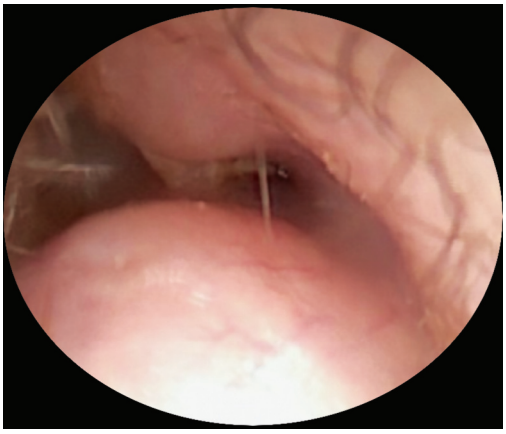


Fig. 2.4: Osteoma

Q.1: What is the most possible diagnosis?

Ans: Osteoma. It is a benign tumor of the cortical bone.

Q.2: How osteoma presents?

Ans: Osteoma arises from the cancellous bone and presents as a single, smooth, bony, hard, pedunculated tumor, often arising from the posterior wall of bony canal, near its outer end.

Q.3: What is the treatment of osteoma?

Ans: Surgical removal by making fracture through its pedicle or removal with a drill.

Q.4: How exostoses differ from the osteoma?

Ans: Exostosis are multiple and bilateral, often seen as smooth, sessile, bony swelling in the deeper part of the external auditory canal near the tympanic membrane. Exostosis is commonly seen among cold water swimmers and divers. In exostosis, males are affected three times more than females.

CASE 5: TRAUMATIC PERFORATION OF THE TYMPANIC MEMBRANE

Presenting complaints: A 13-year-old boy presents with hearing loss and pain in the right ear after severe slap to the right side of the face.

Otoscopic examination: A moderate perforation in the lower part of the tympanic membrane (Fig. 2.5). The margin of the perforation is irregular and blood tinged.

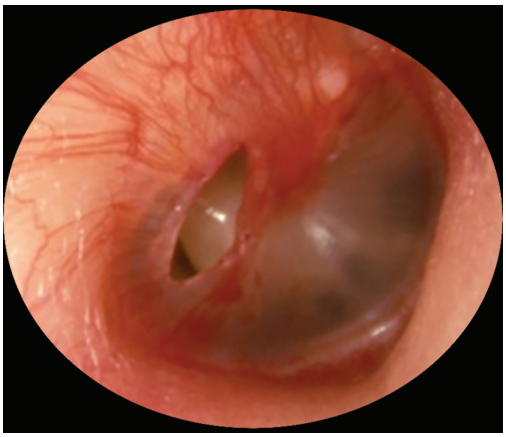


Fig. 2.5: Traumatic perforation in TM

Q.1: What is the most possible diagnosis?

Ans: Traumatic perforation of the right tympanic membrane.

Q.2: What are the causes of traumatic perforation of the tympanic membrane?

Ans: Direct violence (attempt to clean ear by matchstick, hair pins, etc. forceful syringing, sneezing or forceful Valsalva procedure). Indirect violence (strong slap, blast injury, skull base fracture, trauma to mandible and barotraumas).

Q.3: What are the common symptoms in traumatic perforation?

Ans: Pain in the ear, hearing loss, tinnitus, giddiness and bleeding from the ear.

Q.4: How the perforated tympanic membrane heals?

Ans: The outer epithelial and inner endothelial (mucosal) layers regenerate to seal the perforation but the middle fibrous layer does not regenerate. Newly formed two layered membrane is called monometric membrane and it is usually transparent.

Q.5: What is the treatment of perforated tympanic membrane?

Ans: Nothing applying in the ear. Avoid water entery into the ear canal. Keep sterilised cotton in meatus. Prophylactic antibiotics. Healing occurs by 6–8 weeks. Unhealed perforation need myringoplasty.

CASE 6: FOREIGN BODY IN THE EAR CANAL

Presenting complaints: An 18-month-old male child referred to ENT department from pediatric surgery department with complaint of an asymptomatic pin like metallic

foreign body in the left external auditory canal. There was no swelling, bleeding or dischanrge in the ear canal.

Examination: There was no scar mark, skin discoloration, swelling or tenderness in the preauricular and postauricular region. The foreign body was embedded between the walls and did not move when attempts was made to remove.

Q.1: What is the plan in the case?

Ans: Foreign body removal is planned under general anesthesia. The foreign body was removed and external auditory canal and tympanic membrane were within normal limits.

Q.2: What are causes for foreign body insertion into the eaternal auditory canal?

Ans: There are several reasons lead to foreign body insertion into the external auditory canal such as accidental entry of objects, curiosity of children, games, attempts to clean the ear canal or itching.

Q.3: What are the prerequisites for removal of the foreign body from external auditory canal in children?

Ans: Removal of the foreign bodies from the external auditory canal is an essential skill and casual removal may result in impaction of foreign body and complications. Foreign body removal from external auditory canal especially in children should be preferably removed with proper instruments under general anesthesia, good illumination and magnification if needed. As retained foreign body may go unnoticed in children for a long time, the ears and nose should be carefully examined in every child attending the ENT out patient department.

CASE 7: MICROTIA

Presenting complaints: A newborn baby presents with bilateral microtia and external auditory canal atresia.

Q.1: What is the ideal age for doing corrective surgery for this case?

Ans: 5 to 7 years.

Q.2: What is the treatment for microtia?

Ans: Microtia typically presents at birth with obvious auricular malformations. Classical treatment involves auricular reconstruction in multiple stages. Patients undergo observation until the age of 5 years to allow for grown of rib cartilage which is harvested for reconstruction. This approach provides the benefit of reconstruction with autogenous material which ultimately requires little or no maintainance.

Q.4: What are congenital anomalies of the pinna?

Ans:

- Anotia: Absence of pinna
- Macrotia: Large pinna
- Microtia: Small pinna
- Mozart's ear: Fusion of crura of antihelix

- Bat ear: Abnromal protrusion of pinna characterized by absence of antihelix
- Lop ear: Variant of bat ear
- Down's syndrome: Small pinna and poorly developed lobule
- Wildermuth's ear: Prominent antihelix
- Malotia: Pinna placed downwards and forwards
- Synotia: Pinna is below the level of maxilla
- Potter's syndrome: Pinna is low set

CASE 8: MALIGNANT OTITIS EXTERNA

Presenting complaints: A 72-year-old diabetic male presented with severe right side ear pain and discharge since one month.

Examiantion: There is rapidly spreading infection of the external auditory canal with involvement of the bone and presence of the granulation tissue.

Q.1: What is the diagnosis of this case?

Ans: Rapidly spreading infection of external auditory canal, seen in diabetic patient with involvement of bone and presence of granulation tissue point towards malignant otitis externa.

Q.2: What is the treatment policy for malignant otitis externa?

Ans: The treatment includes correction of immunosuppression (when possible), local treatment of external auditory canal, long term systemic antibiotic therapy and in selected patient surgery.

Q.3: What is the etiology for malignant otitis externa?

Ans: Malignant otitis externa is a misnomer where the term malignant does not indicate malignant pathology. It is an inflammatory condition caused by Pseudomonas infection. It is seen in elderly diabetic/immunocompromised patients/patients on immunosuppressive drugs.

Q.4: Which cranial nerve most commonly affected in malignant otitis externa?

Ans: As this infection spreads to temporal bone and base of skull, it may involve cranial nerves. Most commonly facial nerve is affected.

Q.5: What are the diagnostic criteria for malignant otitis externa?

Ans:

- Refractory external otitis
- Severe nocturnal otalgia
- Purulent ear discharge
- Granulations in deep external ear canal
- *Pseudomonas aeruginosa* in culture
- Diabetes or any other immunocompromised state

Q.6: Which is the gold standard for diagnosis of malignant otitis externa?

Ans: Positive technetium 99 bone scan.

Gallium scan (for prognosis)

Other investigations are culture and sensitivity, CT/MRI to assess the extent and biopsy to rule out malignancy.

Q.7: Which drugs are considered as drug of choice in malignant otitis externa?

Ans:

- Cefepime/ceftazidime (3rd generation cephalosporin)
- Antipseudomonal penicillin with an aminoglycoside/fluoroquinolone

CASE 9: PERICHONDRITIS OF PINNA

Presenting complaints: A 28-year-old boxer in profession suffered injury to the right pinna during the fight with another boxer since 15 days back.

On examination: The right pinna deformed and appears as cauliflower look.

Q.1: What is the cause of the deformed pinna which appears as cauliflower?

Ans: Perichondritis of the pinna due to blunt trauma.

Q.2: What is pathophysiology behind the perichondritis of the pinna of above patient (boxer)?

Ans: Blunt trauma to the pinna in boxer causes hematome of pinna (collection of blood between auricular cartilage and perichondrium) which results in deformity, called cauliflower ear.If infection occurs in hematoma, it leads to severe perichondritis of the pinna.

Q.3: Which bacteria is associated with perichondritis of the pinna?

Ans: Perichondritis of the pinna is most commonly caused by *Pseudomonas aeuroginosa*.

Q.4: What are clinical symptoms of the perichondritis of the pinna?

Ans: Initial symptoms are red, hot and painful pinna which feels stiff. Later abscess may form between the cartilage and perichondrium with necrosis of the cartilage as the cartilage survives only on blood supply from its perichondrium.

CASE 10: CERUMEN

Presenting complaints: A 10-year-old boy presenting with left ear pain and decrease hearing in the same ear since 20 days.

Otoscopic examination: Dark to brownish and soft to hard material filling the right external auditory canal.

Q.1: What is the diagnosis?

Ans: Cerumen

Q.2: How cerumen/wax is formed?

Ans: Wax is composed of secretion of sebaceous glands, ceruminous glands, hair, desquamated epithelia debris, keratin and dirt.

Q.3: What are the functions of the wax in external auditory canal?

Ans: Wax has a protective function as it lubricates the ear canal and entraps the foreign body that happens to enter the canal. Its acidic pH and is bacteriostatic and fungistatic.

Q.4: What are wax softners?

Ans:

- 5% sodium bicarbonate
- Diluted hydrogen peroxide
- Liquid paraffin
- Olive oil
- 2% paradichlorobenzene

Q.5: What are the etiology factors for excess wax formation?

Ans:

- Obliquity of the external auditory canal/narrow ear canal
- Excessive secretions of the wax
- Faulty method for cleaning of the ear
- Dusty environment
- Dry hot climate
- Exostosis
- Stiff hairs in the ear canal

Q.6: What are the contents of the wax?

Ans:

- High concentration of lipid
- Lysozymes
- Immunoglobulins

CASE 11: INSECT IN EXTERNAL AUDITORY CANAL

Presenting complaints: A 3-year-old boy presented with severe pain in the right ear after sudden entry of an insect in ear canal.

On examination: A living insect inside the right side external auditory canal with visibility of its crawling movement.

Q.1: What should be done first in this case ?

Ans: Live foreign body (insect) in the ear canal is a dire emergency. Before removal, it should be killed by instillation of oil/spirit, since a struggling insect can produce grievous consequences like tympanic membrane rupture, ossicular disruption and even inner ear damage. After killing of the live foreign body, it can be removed by forcep under general anesthesia in case of children or by syringing without under general anesthesia.

Q.2: What are the different types of foreign bodies in ear?

Ans:

- **Living:** Insect, maggots
- **Non-living:** Hygroscopic and non-hygroscopic
- **Hygroscopic non-living foreign body:** Vegetables such as peas, beans, seeds, etc.
- **Non-hygroscopic non-living foreign bodies:** Animate—insects, flies, maggots; Inanimate—stones, stitch, rubber, pencil, plastic materials.

Q.3: What are the clinical presentations of the foreign body in the ear canal?

Ans: Pain, apprehension of parents, deafness (partial) and irritation in the ear canal.

Q.4: How the foreign bodies from the external auditory canal are removed?

Ans:

- Living foreign body: Instill oil or water to the ear to suffocate to death of living foreign body, then removed by forceps or syringing.
- Hygroscopic foreign body: Shrinkage of the swollen foreign body by instillation of spirits, glycerine, then remove by ring curette or syringing.
- Non-hygroscopic foreign body can be removed by ring part of the Jobson Horne's probe or by syringing.
- Sometimes under general anesthesia, foreign body is removed with a view not to damage tympanic membrane/ossicles.
- If the foreign body entered into the middle ear by perforating into the tympanic membrane, then should be removed on postaural approach under general anesthesia or by transcanal endoscopic method under genral anesthesia (in children)/local anaesthesia (in adult).

Q.5: What are the complications of the foreign body in the ear canal?

Ans:

- Vasovagal attack
- Perforation of tympanic membrane
- Entry of foreign body into middle ear
- Otitis externa
- Otitis media
- Ossicular injury

CASE 12: EXOSTOSES (DIAPHYSEAL ACLASIS)

Presenting complaints: A 30-year-old man presenting with decreased hearing since 3 months. He had no history of ear discharge. The patient is swimmer in profession.

On examination: Multiple painless nodular swelling in the lumen of external auditory canal in both sides.

Q.1: What is the possible diagnosis?

Ans: Exostoses (surfer's ear)

Q.2: What are exostoses?

Ans: These are periosteal outgrowths, which grow away from the ivory bone so called exostoses. These are often occur at epiphysis of growing end of bone.

Q.3: Is it a bony tumor?

Ans: It is considered as cancellous osteoma but actually it is a disorder of bone growth and is not a tumor. It is cancellous bone covered with cortical bone. Bas is broad and other end is covered with cartilage.

Q.4: What are salient features of the exostoses?

Ans:

- It is common in persons with multiple exposure to swimming in cold water.
- It is painless and slow growing bony swelling.
- It is mainly found in cartilaginous bone.
- Swelling is adherent to underlying bone with broad base.

Q.5: What are the complications of exostoses?

Ans:

- Infections
- Deafness
- Impacted wax and desquamated epithelial debris due to defective cleaning mechanism.

Q.6: What is the treatment of exostoses?

Ans: Excision of exostoses with micro-drill.

CASE 13: MICROTIA

Presenting complaints: A 5-year-old girl presenting with small size pinna in left side (Fig. 2.6).

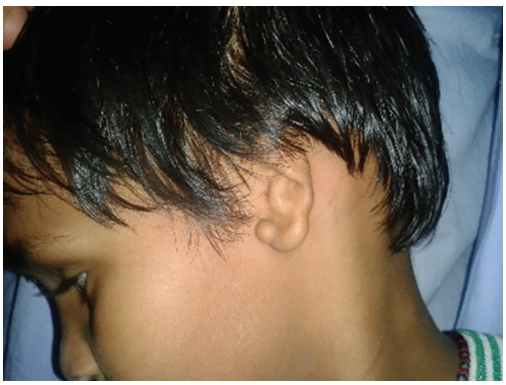


Fig. 2.6: Microtia

Q.1: What is provisional diagnosis?

Ans: Microtia

Q.2: How does a malformed pinna develop?

Ans: The pinna develops from the six hillock of His. Maldevelopment or failure of fusion can result in gross abnormalities of the ear. Microtia is a deformed small sized pinna. It may or may not be associated with middl or inner ear abnormalities.

Q.3: What is the classification of congenital malformed pinna?

Ans:

- Grade I: Normal ear
- Grade II: All pinna elements present but malformed
- Grade III: Rudimentary bar only
- Grade IV: Absent pinna (anotia)

CASE 14: EUSTACHIAN TUBE DYSFUNCTION

Presenting complaints: A 25-year-old man presented with fullness in the right ear since 5 days. He had common cold 5 days back.

Otoscopic examination: Right side: External auditory canal: Normal; tympanic membrane appears dull and lustreless. Cone of light was absent. Left ear: Normal.

Valsalva maneuver: No movement of the tympanic membrane during maneuver.

Q.1: What is the possible diagnosis?

Ans: Right side eustachian tube dysfunction.

Q.2: What are the changes in the tympanic membrane in case of eustachian tube dysfunction?

Ans:

- Lustreless tympanic membrane
- Cone of light absent or distorted
- Sickle-shaped anterior and posterior malleolar folds
- Foreshortening of the handle of malleus
- Tympanic membrane retracted medially
- Lateral process of malleus appears prominent

Q.3: What are the functions of the eustachian tube?

Ans: Physiologically, eustachian tube performs three main functions such as:

- Ventilation and thus regulation of the middle ear pressure
- Protection against nasopharyngeal sound pressure and reflux of nasopharyngeal secretions
- Clearance of middle ear secretions

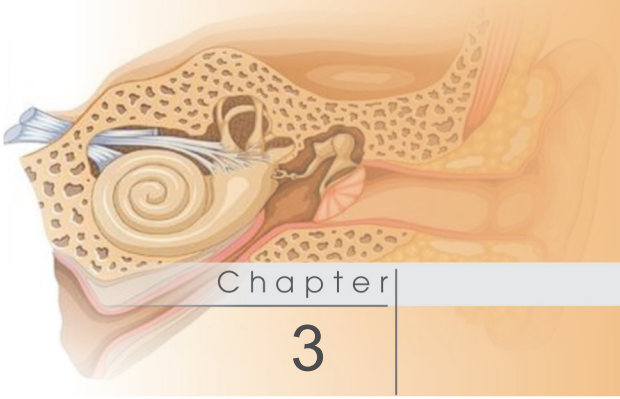
Q.4: What are the eustachian tube function tests?

Ans: Different eustachian tube function tests are: Valsalva test, politzer test, catheterization test, Toynbee's test, tympanometry, radiological test, saccharine or methylene blue test and sonotubometry.

Q.5: What are the causes of eustachian tube obstruction?

Ans:

- Upper respiratory infection (viral or bacterial)
- Sinusitis
- Allergy
- Nasal polyps
- Deviated nasal septum
- Nasopharyngeal tumors/mass
- Cleft palate
- Submucous cleft palate
- Adenoid hypertrophy
- Down syndrome
- Functional



Chapter 3

Otitis Media

CASE 1: ASOM (ACUTE SUPPURATIVE OTITIS MEDIA)

Presenting complaints: Doctor, my son has severe right ear pain since last night.

Setting: Outpatient department (OPD)

History of presenting illness: A 4-year-old boy complaining severe pain in the right ear since last night. He has history of common cold since last 5 days.

General physical examination: The child is well oriented with time, place and person. Pulse rate: 92 BPM. Blood pressure: 108/70 mmHg.

Examinations of pinna and surrounding area: Normal

Otoscopic examination: Congested tympanic membrane (Fig. 3.1). Leash of blood vessels seen along the handle of malleus and at the periphery of tympanic membrane showing a cart-wheel appearance.

Facial nerve examination: Bilateral facial nerves are normal.

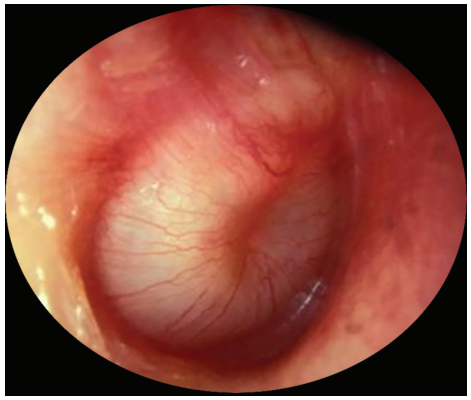


Fig. 3.1: Congested tympanic membrane

Q.1: What is the most possible diagnosis?

Ans: Right side ASOM.

Q.2: Why ASOM is more common in infant and children?

Ans: Eustachian tube in infants and young children is shorter, wider and more horizontal and thus transmit more infection from nasopharynx to middle ear. Breast

or bottle feeding in infant in a horizontal position may force fluids through the tube into the middle ear. The immunity of infant and young children are low which promote more infections in middle ear.

Q.3: What are the common bacteria causing ASOM?

Ans: Commonest bacterial agents are *Streptococcus pneumonia, H. influenzae* and *Moraxella catarrhalis*.

Q.4: What is the medical treatment for ASOM?

Ans: Drug of choice is amoxicillin (high dose). In resistant cases, amoxicillin plus clavulanic acid or cefuroxime is used.

Q.5: What are the indications for myringotomy in ASOM?

Ans: ASOM with complications, ASOM with severe pain, unresolved ASOM, ASOM not responding to medical treatment.

Q.6: What is lighthouse sign?

Ans: In suppurative stage of ASOM, otoscopy shows pulsatile discharge may reflect the light intermittently. This is called lighthouse sign.

CASE 2: SECRETORY OTITIS MEDIA

Presenting complaints: A 5-year-old boy with ASOM undergoing treatment with pencillin therapy for 7 days now presents with subsidence of pain but persistence of deafness.

Setting: Outpatient department.

Otoscopic examination: Bilateral tympanic membranes are dull, bulged and air bubbles with fluid level are present behind it (Fig. 3.2).

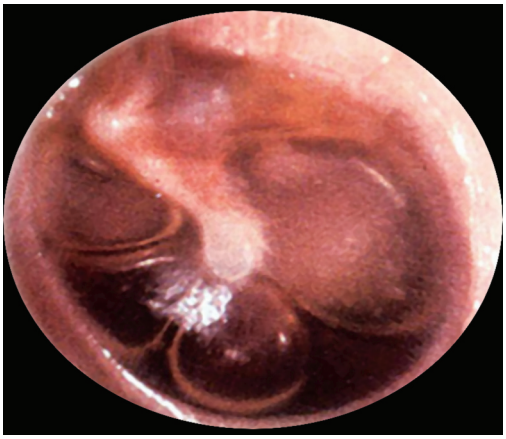


Fig.3.2: Dull TM with air and fluid levels behind it

Examination of pinna and external auditory canal: Normal.

Examination of nose, sinus, oral cavity and oropharynx: Normal.

Pure tone audiometry: Bilateral moderate conductive hearing loss.

Q.1: What is the most possible diagnosis?

Ans: This is a case of secretory otitis media (SOM) developing over ASOM probably due to biofilms formation. So some symptoms of ASOM, i.e. pain and fever has subsided but due to persistence of fluid deafness is persisting.

Q.2: What is the significance of otitis media in children?

Ans: It is the most common cause of conductive deafness in children. Usually bilateral secretory otitis media in a child is due to adenoid hypertrophy.

Q.3: What is the type of tympanogram in secretory otitis media?

Ans: Type-B curve.

Q.4: What is the significance of unilateral secretory otitis media in adult?

Ans: An adult presenting with unilateral secretory otitis media, always rule out nasopharyngeal carcinoma.

Q.5: What is the treatment of secretory otitis media?

Ans: Medical treatment includes anti-allergics, steroids, decongestants, mucolytics and antibiotics. Mainstay of treatment is surgical which is myringotomy with grommet insertion. This is indicated in hearing loss of more than 25 decibel persisting for more than 3 months.

CASE 3: CSOM-TTD (CHRONIC SUPPURATIVE OTITIS MEDIA-TUBOTYMPANIC DISEASE)

Presenting complaints: A 35-year-old female presented at the otolaryngology outpatient department with complaints of right ear discharge since childhood, decreased hearing in the right ear since 3 years and headache since 6 months.

History of present illness: Right ear discharge was started since childhood and the discharge was insidious in onset, intermittent, profuse, mucoid to mucopurulent, non-foulsmelling, nonblood stained discharge, more during upper respiratory tract infections, relieved on application of topical ear drops. He had last ear discharge 3 months back. Decreased hearing in the right side started 3 years back, insidious in onset and progressive in nature. There was no history of giddiness or tinnitus. He had history of headache since 6 months, insidious in onset, gradually progressive, intermittent, bifrontal, more on bending forward, more in the morning and more during upper respiratory tract infection. No history of visual aura, vomiting, decreased vision, recurrent nasal obstruction or mouth breathing, sneezing or blood stained nasal discharge.

Past history: No history of diabetes mellitus, hypertension, bronchial asthma, ischemic heart disease, pulmonary tuberculosis or drug allergy and no past history of surgery in head and neck area. Patient was using topical ear drops and medication for headache from local doctors.

Family history: She is married and has one child and no other significant illness in the family.

Personal history: Sleep and appetite are normal. Bowel and bladder habits are normal.

Menstrual history: She has regular menstrual cycles and last menstrual period 20 days back.

General physical examination: Average body built. She has no pallor, cyanosis, icterus, koilonychias, clubbing, lymphadenopathy or pedal edema. Pulse rate: 82/min, regular, BP: 120/80 mmHg in left arm supine position. Temperature: Normal, Respiratory rate: 16/min.

Examinations of pinna and pre- and postaural region: Both sides pinna and pre-/postaural region are normal. There are no tragal and mastoid tenderness.

Examination of external auditory canal: Normal in both sides.

Examination of tympanic membrane: Large central perforation (Fig. 3.3) in right side whereas normal in left side.

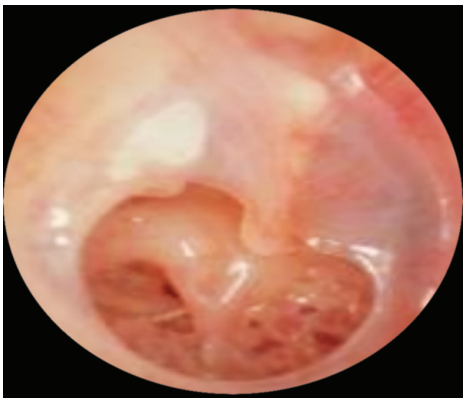


Fig. 3.3: Large central perforation

Fistula test: Negative in both sides.

Facial nerve examinations: Normal in both sides.

Tuning fork test: Rinne negative in right side and positive in left. Weber lateralized to the right. ABC is normal in both sides.

Q.1: What is the diagnosis?

Ans: Right side chronic suppurative otitis media-tubotympanic type.

Q.2: Why it is not an unsafe type of CSOM?

Ans:

- The perforation in the tympanic membrane is central perforation.
- Absence of cholesteatoma/granulations.
- Mild to moderate conductive hearing loss.
- No evidence of complications.

Q.3: What are the investigations in safe or unsafe type of CSOM?

Ans: Important investigations are:

- Culture and sensitivity of ear discharge.
- Pure tone audiometry.
- X-ray mastoid (lateral oblique view).
- CT scan of the temporal bone.

Q.4: What are the organisms isolated from CSOM?

Ans: *Pseudomonas aeruginosa, Proteus, E. coli, Staphylococcus* and anaerobes.

Q.5: What is tubotympanic disease?

Ans: It is a benign type of CSOM, characterized by copious, mucoid, odorless otorrhoea, a central perforation and mild to moderate conductive hearing loss with rare complications.

Q.6: What is a central perforation? Why it is the commonest type of perforation?

Ans: Central perforation is confined to the pars tensa and has an intact rim of tympanic membrane all around. It is associated with tubotympanic type of CSOM. The blood supply of tympanic membrane is anterior tympanic branch of maxillary artery and stylomastoid branch of posterior auricular artery. The pattern of blood supply is from periphery to center, making central part of tympanic membrane least vascular and thus more prone for ischemia and thus makes it a commonest site for perforation in otitis media.

Q.7: Which perforation in tympanic membrane cause more hearing loss—anterior or posterior?

Ans: Posterior perforation causes more hearing loss, since the reciprocal movement of the round window round membrane in response to sound stimulus (round window baffle) is impeded by sound waves directly falling on the same through the perforation.

Q.8: Is there hearing improvement in CSOM with discharge?

Ans: Yes. Hearing improves at the time of discharge in a large perforation due to the 'round window shielding effect' caused by the discharge.

Q.9: What will be the management of safe type of CSOM?

Ans: The aim of the treatment is to give the patient a dry and normal hearing ear.

- Aural toileting.
- Antibiotics as per culture and sensitivity report.
- Nasal decongestants for making patent eustachian tube.
- Treating the possible underlying cause like chronic sinusitis or tonsillitis.
- Once ear become dry, myringoplasty or tympanoplasty can be done.

Q.10: What are the stages of CSOM during its disease process?

Ans:

- Active stage: Here the ear is discharging and the mucosa of middle ear will appear to be hypertrophied, velvety and congested.
- Inactive stage: There is dry perforation and no discharge at the time of examination.
- Quiescent stage: Perforation of the tympanic membrane is present and ear is dry for quite some time.
- Healed stage: Perforation of the tympanic membrane is healed with a thin scar.

Q.11: What are the causes for sensorineural hearing loss in CSOM?

Ans:

- Absorption of bacterial toxin through round window.
- Prolonged use of ototoxic ear drops.
- Erosion of bony labyrinth by cholesteatoma.

Q.12: What are the materials used for myringoplasty?

Ans:

- Temporalis fascia (most commonly used)
- Tragal perichondrium
- Conchal perichondrium
- Tragal cartilage
- Dorsal vein graft
- AlloDerm (synthetic human dermis)
- Areolar tissue which lies superficial to the temporalis fascia.

Q.13: What are the prerequisites for tympanoplasty?

The prerequisites for tympanoplasty are:

- Good cochlear reserve
- Dry ear
- Good eustachian tube function
- Healthy middle ear mucosa
- Sound transmission to oval window and sound protection to round window

CASE 4: CSOM-AAD (CHRONIC SUPPURATIVE OTITIS MEDIA-ATTICOANTRAL DISEASE)

Presenting complaints: A 15-year-old boy presents with foul smelling scanty discharge from right ear since 5 years.

History of present illness: He was apparently alright 5 years back. To start with right ear discharge was started since 5 years. The ear discharge is foul smelling, scanty and throughout the year. Decreased hearing in the right side started 4 years back, insidious in onset and progressive in nature. There was no history of giddiness or tinnitus. He had history of headache since 6 months, insidious in onset, gradually progressive, intermittent, bifrontal, more on bending forward, more in the morning and more during upper respiratory tract infection. No history of visual aura, vomiting, decreased vision, recurrent nasal obstruction or mouth breathing, sneezing or blood stained nasal discharge.

History of past illness: No history of diabetes mellitus, hypertension, bronchial asthma, ischemic heart disease, pulmonary tuberculosis or drug allergy and no past history of surgery in head and neck area. Patient was using topical ear drops and medication for headache from local doctors.

General examination: Moderately built, nopallor, cyanosis, icterus, clubbing, lymphadenopathy, koilonychias and pedal edema. BP: 122/82 mm Hg in right arm in supine position. Respiratory rate: 14/min afebrile.

Otoscopy examination: There is attic perforation in the pars flaccid of right tympanic membrane (Fig. 3.4).

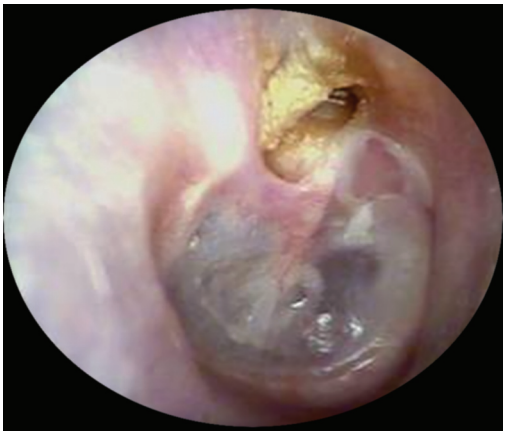


Fig. 3.4: Attic perforation with cholesteatoma

Tuning fork test: Rinne's test—negative in the right side and positive in left side. Weber is lateralized to the right ear. Schwabach test—lengthened on the right side while equal on the left side. Absolute bone conduction test—normal on both sides.

Q.1: What is the possible diagnosis?

Ans: Right side CSOM—atticoantral disease. Foul smelling otorrhea is suggestive of atticoantral disease. Patient has attic perforation, is in favor of CSOM with atticoantral disease (AAD).

Q.2: What is the treatment of CSOM-AAD?

Ans: As AAD is a bone eroding disease, it has to be exenterated and exteriorized, preferably by an open cavity procedure like modified radical mastoidectomy. The hearing mechanism should be reconstructed by tympanoplasty.

Q.3: What are the characteristic features of atticoantral diseases/unsafe type of CSOM?

Ans: Attic or posterosuperior marginal perforation in tympanic membrane. It is often associated with cholesteatoma. Patient usually present with foul smelling ear discharge and hearing loss.

Q.4: What is the characteristic ear discharge in CSOM-AAD?

Ans: Atticoantral type of CSOM/cholesteatoma/marginal perforation is characterized by scanty foulsmelling, painless discharge from the ear. The foul smell is due to saprophytic infection and osteitis.

Q.5: What are the causes of blood stained discharge from the ear?

Ans: CSOM with granulations, acute otitis media with perforation in TM, acute hemorrhagic otitis externa, Glomus jugulare and malignancy of external or middle ear.

Q.6: What is the treatment of choice in atticoantral type of CSOM?

Ans: Treatment of choice for atticoantral variety of CSOM is surgery, i.e. modified radical mastoidectomy.

Q.7: What are the differences between mucosal and squamous type of CSOM?

Ans:

	Mucosal/tubotympanic	*Squamous/aticoantral*
1. Ear discharge	Profuse, mucoid/mucopurulent	Scanty, thick, purulent, foetid
2. Blood stained discharge	Absent	Usually present
3. Perforation	Central	Attic or posterosuperior marginal
4. Deafness	Conductive	Conductive, mixed
5. Aural polyp	Uncommon/pale polyp	Red polyp
6. Fistula test	Negative	May be positive
7. Headache, vertigo	Usually absent	Present in advanced cases
8. Pathology	In the mucosa of the middle ear cleft	Squamous epithelial ingrowth into middle ear cleft
9. Cholesteatoma	Not present	Present
10. Complications	Absent	Common
11. Radiology	No bone erosion	Evidence of bone erosion

Q.8: What are the causes of progressive hearing loss?

Ans:

- Presbyacusis
- Meniere's disease
- Otosclerosis
- Acoustic neuroma

Q.9: What are the important clinical findings in atticoantral diseases and what is the best treatment?

Ans: Important clinical findings are:

- History of foul smelling ear discharge and may be associated with blood stained discharge.
- Sagging of posterosuperior meatal wall.
- Marginal or attic perforation of tympanic membrane.
- Granulations and/or evidence of cholesteatoma.
- Moderate to severe SNHL or mixed hearing loss.
- Sometimes complications like facial palsy, brain abscess or meningitis or lateral sinus thrombosis are associated with otitis media.

The treatment in atticoantral disease or unsafe ear is mastoid exploration (MRM).

Q.10: What is ironed out mastoid?

Ans: Ironed out appearance of mastoid is a feature of acute mastoiditis due to thickening of mastoid process because of periostitis.

Q.11: What is erection of pinna?

Ans: In erection of pinna, the pinna is pushed forward, outward and downward. It is seen in mastoid abscess.

Q.12: What leads to foul smelling discharge from ear?

Ans: Foul smelling ear discharge is due to saprophytic bacteria and osteitis caused by cholesteatoma. Causes of foul smelling ear discharge are:

- Unsafe type of CSOM.
- Granulomatous conditions.
- Myiasis.
- Foreign body.
- Malignancy with secondary infection.

Q.13. What are the types of tympanic membrane perforations in unsafe type of CSOM?

Ans:

- Attic
- Posterosuperior marginal
- Central (rare)

Q.14. What leads to foul smelling discharge from the ear?

Ans: In atticoantral/unsafe type of CSOM, the foul smelling ear discharge is due to saprophytic bacteria and osteitis caused by cholesteatoma.

The causes of the foul smelling ear discharge are:

- Atticoantral type of CSOM
- Granulomatous condition
- Myiasis
- Foreign body in ear
- Malignancy of the ear with secondary infections.

CASE 5: TUBERCULAR OTITIS MEDIA

Presenting complaints: A 30-year-old man presented with painless ear discharge since 2 years. He had hearing loss since 6 months.

Setting: Out patient department.

Otoscopic examination: Multiple small perforations seen in the anterior part of tympanic membrane.

Q.1: What is the most possible diagnosis?

Ans: Tubercular otitis media.

Q.2: What are the classical features of the tubercular otitis media?

Ans: Multiple perforations in tympanic membrane, pale granulations in ear, painless ear discharge, early complications and hearing loss is out of the proportion to disease.

Q.3: How the diagnosis of the tubercular otitis media is confirmed?

Ans: Histological examination of the granulations from the middle ear, chest X-ray, PCR for TB.

Q.4: What are the characteristic features of otoscopic picture in TB otitis media?

Ans: The ear discharge is serosanguinous or sometimes blood stained, granulation even in central perforation and the edge of the perforation is pale, thin and undermined.

Q.5: What are the types of the TB otitis media?

Ans: Primary tuberculosis, often seen in pediatric population. Secondary tuberculosis otitis media occurs secondary to pulmonary tuberculosis which is common among young adults.

Q.6: What is the treatment of tuberculosis otitis media?

Ans: Antitubercular therapy.

Q.7: What are the lesions in the middle ear causing conductive hearing loss?

Ans: The middle ear lesions causing conductive hearing loss are:

- Eustachian tube dysfunction.
- Acute otitis media.
- Middle ear effusion.
- Adhesive otitis media.
- Tympanosclerosis.
- Hemotympanum.
- Tympanic membrane perforation.
- Cholesteatoma.
- Ossicular chain discontinuity.
- Ossicular fixation as in otosclerosis.
- Congenital absence or malformation of the ossicular chain.
- Tumors of the middle ear.
- Previous middle ear surgery.

CASE 6: GRADENIGO SYNDROME

Presenting complaints: A 35-year-old man presented with right ear discharge since 10 years, right side orbital pain since one month and complaining double vision since 15 days.

Setting: Out patient department.

History of present illness: He was apparently alright 10 years back. To start with right ear discharge since 10 years. The discharge was scanty, foul smelling and persisting throughout the year. He has associated with double vision and retro-orbital pain.

History of past illness: He has no diabetes, hypertension, tuberculosis and not associated with any systemic diseases.

Q.1: What is the most probable diagnosis?

Ans: Gradenigo syndrome. The triad of otorrhea, retro-orbital pain and diplopia in apical petrositis is known as Gradenigo's syndrome.

Q.2: What is the cause of Gradenigo syndrome?

Ans: It is a triad, consists of ear discharge, diplopia and retro-orbital pain. It is due to petrositis which is a complication of otitis media. Petrous apex may be pneumatised in about 30% cases with connecting cell tracts from the mastoid. This may hence predispose to spread of infection to petrous apex from the middle ear cleft suppuration. There is involvement of 5th and 6th cranial nerves which are close to the petrous apex. It can also be seen in extradural abscess and meningitis of the petrous apex.

Q.3: What is the cause of diplopia and retro-orbital pain in petrositis?

Ans: Diplopia is due to lateral rectus palsy due to abducent nerve involvement and retro-orbital pain is due to trigeminal neuralgia. Abducent and trigeminal cranial nerves passes near the petrous apex, involved in apical petrositis.

Q.4: How cranial nerves are involved in the petrositis?

Ans: The 6th cranial nerve runs in the **Dorello's canal** (canal in between the petrous tip and sphenoid bone) at the petrous apex and the 5th cranial nerve lies in the Meckel's cave which is a concavity on the anterior slant of petrous part of the temporal bone near the petrous apex in which the 5th nerve ganglion (gasserian ganglion) rests. So in petrositis, the two cranial nerves are commonly involved.

Q.5: What is the treatment of petrositis?

Ans: Petrositis is managed by antibiotics and mastoid exploration along with curettage of the fistulous tract to drain abscess from the petrous apex.

CASE 7: CHRONIC OTITIS MEDIA WITH ATTICOANTRAL DISEASE

Presenting aymptoms: A 15-year-old boy presenting with right ear discharge since 3 years. The discharge was scanty and foul smelling.

Otoscopic examination: Posterior superior retraction pocket with cholesteatoma in the right ear.

Q.1: What is the diagnosis?

Ans: Posterior superior retraction pocket is usually associated with primary acquired cholesteatoma which is turn causes atticoantral or unsafe type of CSOM.

Q.2: What is the treatment of choice?

Ans: Surgery is the treatment of choice. Mastoid exploration is the treatment. It may be canal wall down and canal wall up procedure. Surgery of the choice is modified radical mastoidectomy.

Q.3: What is canal wall down procedure?

Ans: Here mastoid cavity is open into the external auditory canal by removing the posterior bony meatal wall so that disease area is fully exteriorized.

Q.4: What are the common canal wall down procedures?

Ans: Modified radical mastoidectomy, radical mastoidectomy and atticotomy.

Q.5: Why the hearing loss in atticoantral disease is termed 'Variable'?

Ans: As the atticoantral disease is a bone eroding disease, so associated with moderate to severe conductive hearing loss because of the ossicular disruption or mixed hearing loss due to inner ear involvement. Sometimes, there may be little hearing loss as the cholesteatoma matrix may bridge the disrupted ossicles in the middle ear providing an efficient sound conduit (bridge cholesteatoma).

CASE 8: LATERAL SINUS THROMBOPHLEBITIS

Presenting complaints: A 32-year-old male having attic cholesteatoma of the left ear with hectic picket fence type of fever (fever with rigors, chills and sweating). He has also complain of headache.

Examination: Tenderness over the left side internal jugular vein. There is edema over the left side mastoid area.

Q.1: What is the possible diagnosis?

Ans: Chronic suppurative otitis media of the left ear along with lateral sinus thrombophlebitis.

Q.2: What is Griesinger's sign?

Ans: Edema appears over the posterior part of the mastoid. This is due to thrombosis of mastoid emissary vein. It is found in lateral sinus thrombophlebitis.

Q.3: What is Crowe-Beck test?

Ans: Pressure on jugular vein of healthy side produces engorgement of retinal veins (seen by ophthalmoscopy) and supraorbital veins. Engorgement of veins subsides on release of pressure. This is seen lateral sinus thrombophlebitis.

Q.4: What is Tobey-Ayer test?

Ans: This is to record CSF pressure by manometer and to see the effect of manual compression of one or both jugular veins. Compression of vein on the thrombosed side of internal jugular vein produces no effect while compression of the vein on healthy side produces rapid rise in CSF pressure which will be equal to the bilateral compression of jugular veins.

Q.5: What is the radiological investigation of choice in lateral sinus thrombosis?

Ans: MRI sacn; both T1 and T2 weighted images show a hyperintense signals on MRI with absent flow. In contrast enhanced CT scan, the delta sign is demonstrated where the walls of the sinus enhance while the lumen does not due to thrombosis.

Q.6: What are the complications of lateral sinus thrombosis?

Ans: Meningitis and subdural abscess, cerebellar abscess, septicemia with metastatic abscess, jugular vein thrombosis with multiple cranial nerve palsy, cavernous sinus thrombosis and otitic hydrocephalus.

CASE 5: ACUTE VERTIGO

Presenting Symptoms

A 35-year-old lady complaints of vertigo spells 4–8 times in the last three days. She felt like the room was spinning and it lasted for few seconds. She experienced vertigo mostly when she changed positions. The vertigo spells seemed to resolve on its own after several seconds.

Examination:

- No associated neurologic symptoms.
- Patient denied hearing loss, otalgia, otorrhea, aural fullness, tinnitus.
- She also denied noise exposure, ear trauma, prior ear surgery, or family history of hearing loss.

Q.1: What is the provisional clinical diagnosis?

Ans: This is a case of BPPV with acute attack.

Q.2: How the BPPV is diagnosed?

Ans: Dix-Hallpike test.

Q.3: What is the treatment of choice in BPPV?

Ans:

- In posterior semicircular canal BPPV, Epley's maneuver, Brandt-Daroff positional exercises and Semont maneuver are useful.
- Barbecue maneuver is useful treatment for horizontal canal BPPV.

Q.4: What are the surgical treatment done in BPPV?

Ans: Surgery is done for intractable cases not responding to particle repositioning procedures or vestibular rehabilitation. Surgical procedures for BPPV of the posterior semicircular canals are singular neurectomy and posterior semicircular canal occlusion.

Q.5: What are the investigations are done in vertigo patients?

Ans:

- Blood investigations—full blood count, blood urea, serum creatinine, fasting blood sugar, thyroid function test, VDRL and autoimmune screening.
- Audiogram—pure tone audiometry to rule out hearing loss.
- MRI scan is helpful in case of brain tumor, strokes or multiple sclerosis.
- ECG is done to rule out cardiac causes for dizziness such as myocardial infarction.

Q.4: What is the treatment of the unsafe type of CSOM with facial nerve palsy?

Ans: The treatment should be urgent mastoid exploration. Modified radical mastoidectomy with decompression of the facial nerve in the fallopian canal is commonly opted in this case

CASE 11: MYRINGOPLASTY

Presenting complaints: A 28-year-old man with known case of right side chronic otitis media with tubotympanic disease underwent right side cortical mastoidectomy and type-I tympanoplasty.

Q.1: What is myringoplasty?

Ans: Closure of perforation of pars tensa of the tympanic membrane is called myringoplasty.

Q.2: What is tympanoplasty?

Ans: The tympanoplasty operation consists of both eradication of middle ear disease and reconstruction of hearing mechanism including tympanic membrane and ossicles. It may be done with or without mastoidectomy.

Q.3: What is type III tympanoplasty?

Ans: It is also called myringostapediopexy or columella tympanoplasty. Here malleus and incus are absent. Here graft lies on stapes suprastructure.

Q.4: What is type IV tympanoplasty?

Ans: Here, malleus, incus and stapes suprastructure are absent and graft is placed between the oval and round windows to create an air pocket around the round window. This narrow middle ear space is called cavum minor, is a mucosa lined space that extends from eustachian tube to the round window. Sound waves in thits type IV tympanoplasty directly hit on the footplate while the round window has been shielded by the cavum minor.

Q.5: What is type V tympanoplasty?

Ans: In type V tympanoplasty, a window (fenestration) is created on the horizontal semicircular canal that is covered with a graft.

Q.6: What are the contraindications for myringoplasty/tympanoplasty?

Ans:

- Active infection/discharge in the middle ear
- Otitis externa
- Nasal allergy
- When other ear is dead or not suitable for hearing aid rehabilitation
- Ingrowth of squamous epithelium into middle ear
- Children below 3 years

Q.7: What is difference between type I tympanoplasty and myringoplasty?

Ans: Though both refer to repair of tympanic membrane, type I tympanoplasty entails exposure of middle ear to inspect the middle ear and also ensures the ossicular integrity.

Q.8: What are the materials used for closure of the perforation of tympanic membrane in myringoplasty/tympanoplasty?

Ans:

- Temporalis fascia (most common)
- Areolar fascia overlying the temporalis fascia
- Perichondrium from the tragus
- Cartilage
- Vein
- Periosteum

Q.9: If the patient has central perforation with sensory neural hearing loss, are you going to get tympanoplasty?

Ans: Yes, because patient may be fitted with hearing aid as persistent discharge in non-operated ear will not allow to get hearing aid.

Q.10. What are the complications of the tympanoplasty?

Ans:

- Displacement/extrusion of graft
- Injury to chorda tympani nerve
- Injury to facial nerve
- Tympanic membrane residual perforation
- Vertigo
- Sensorineural hearing loss
- Perilymph fistula

Q.11: If this patient refuses for surgery, what are the problems patient may come across?

Ans:

- Recurrent discharge
- Gradual hearing loss
- Tympanosclerosis
- Adhesive changes
- Very rarely complications may arise due to formation of cholesteatoma

CASE 12: CSOM WITH LABYRINTHINE FISTULA

Presenting complaints: A 35-year-old man presented with foul smelling, scanty and blood stained discharge in right ear since 8 years. He had giddiness during cleaning of the right ear.

Otoscopic examination: Attic perforation in the right ear.

Fistula test: Positive in right ear.

Q.1: What is the diagnosis?

Ans: Right CSOM with atticoantral disease with labyrinthine fistula.

Q.2: What is fistula test?

Ans: The fistula test is performed by applying intermittent pressure on the tragus or by using Siegel's speculum. Normally the test is negative because the pressure changes in the external auditory canal cannot be transmitted to the labyrinth.

Q.3: What is positive fistula test?

Ans: The fistula test is positive when there is erosion of horizontal semicircular canal as in cholesteatoma or a surgically created window in the horizontal canal (fenestration operation), abnormal opening in the oval window (poststapedectomy fistula) or the round window (rupture of the round window membrane). A positive fistula test also implies that the labyrinth is still functioning.

Q.4: What is false negative fistula test?

Ans: It is seen when cholesteatoma covers the site of fistula and does not allow pressure changes to be transmitted to the labyrinth.

Q.5: What is false positive fistula test?

Ans: This is positive fistula test without presence of a fistula. It is seen in congenital syphilis and in about 25% cases of Meniere's disease (Hennebert's sign). In congenital syphilis, stapes footplate is hypermobile while in Meniere's disease, it is due to the fibrous bands connecting utricular macula to the stapes footplate. In both these conditions, movememtns of stapes footplate of stapes result in stimulation of the utriculation of the utricular macula.

CASE 13: CHRONIC EAR DISCHARGE

Presenting complaints: A 68-yea-old man presented with foul smelling discharge from left ear since one year. It was occasionally associated with blood stained discharge.

Otoscopic examination: Attic retraction pocket with granulation present in left side.

Q.1: What are the causes of the foul smelling ear discharge?

Ans:

- Unsafe type of CSOM
- Myiasis
- Granulomatous conditions
- Foreign body in ear
- Malignancy with secondary infection

Q.2: What indicates blood stained discharge from ear?

Ans:

- Granulations
- Polypoidal masses
- Macerations during cleaning
- Malignancy
- Malignant otitis externa

Q.3: What is the cause of foul smelling discharge from ear in atticoantral type of CSOM?

Ans: Foul smelling discharge is due to saprophytic bacteria and osteitis caused by cholesteatoma.

Q.4: What are the different grades of attic retraction pocket?

Ans: In attic retraction pocket

- Grade I: Pars flaccida not touching neck of the malleus
- Grade II: In contact with neck of malleus
- Grade III: Some erosion of scutum, i.e. outer attic wall
- Grade IV: Marked erosion of outer attic wall

Q.5: What is the most important diagnostic procedure for diagnosis of choesteatoma?

Ans: Most important diagnostic procedure in confirming the presence of cholesteatoma is microscopic examination of the patient.

Q.6: What is the cause of erosion by cholesteatoma?

Ans: Cholesteatoma erodes due to enzymes secreted by perimatrix of the cholesteatoma, i.e. osteoclasts such as collagenase, proteolytic enzymes and acid phosphatase.

CASE 14: CORTICAL MASTOIDECTOMY

Presenting complaints: A 25-year-old man underwent right cortical mastoidectomy and type I tympanoplasty for right CSOM with tubotympanic disease.

Q.1: What are the other synonyms of the cortical mastoidectomy?

Ans: Schwartz operation or complete mastoidectomy or simple mastoidectomy.

Q.2: What is cortical mastoidectomy?

Ans: Cortical mastoidectomy is complete exenteration of all the accessible mastoid air cells and converting them into a single cavity without disturbing the anatomy and physiology of the middle ear.

Q.3: What are indications for cortical mastoidectomy?

Ans:

- Acute coalescent mastoiditis
- Incompletely resolved acute otitis media with reservoir sign
- Masked mastoiditis
- As an approach for endolymphatic sac decompression, decompression of facial nerve, translabyrinthine or retrolabyrinthine procedures for acoustic neuroma.

Q.4: What is Donaldson's line?

Ans: Donaldson's line is an imaginary line from lateral semicircular canal, bisecting the perpendicular formed by posterior semicircular canal. Importance is that the superior part of endolymphatic sac is locted here.

Q.5: What are the different incisions made in case of tympanomastoid surgery?

Ans:

- Postaural approach: Wilde's incision
- Endaural approach: Lempert's incision
- Transcanal or permeatal approach: Rosen's incision

Q.6: What is Korner's septum (petrosquamous lamina)?

Ans: It represents the site of embryological fusion of the squamous and petrous position of the temporal bone. A plate of bone persists between the two parts called Korner's septum.

Q.7: What is Trautmann's triangle?

Ans: It is atriangle which leads to posterior fossa. Boundaries are superior petrosal sinus superiorly, sigmoid sinus posteriorly and bony labyrinth anteriorly.

Q.8: What is sinodural angle?

Ans: Sinodural angle is also called Citelli's angle. It is situated between the sigmoid sinus and middle fossa dura plate.

Q.9: What is solid angle?

Ans: It is the area where three bony semicircular canals meet.

Q.10: What are the burrs used for mastoidectomy?

Ans:

- Cutting burrs: To open the cortex (for rapid removal of bone) and are used in most of the bony work.
- Diamond burr: To smooth the cavity and they are used near facial nerve dura and sinus. Heat production will be more with these burrs and hence require more irrigation.
- Polishing burrs: To smooth the cavity at the end of the operation.

CASE 15: MODIFIED RADICAL MASTOIDECTOMY

Presenting complaints: A 30-year-old man diagnosed for right CSOM with atticoantral disease in right ear. He underwent right modified radical mastoidectomy under general anesthesia. During surgery extensive cholesteatoma was found.

Q.1: What is modified radical mastoidectomy?

Ans: This is a canal wall down procedure where disease tissue completely removed from the middle ear and mastoid along with reconstruction of hearing is done. Here middle ear, attic and mastoid cavity is made into a single space.

Q.2: What are the salient features for successful modified radical mastoidectomy?

Ans:

- Adequate reduction of the facial ridge
- Complete removal of facial bridge

- Removal of anterior and posterior buttress
- Good saucerization of the mastoid cavity
- Wide meatoplasty

Q.3: What is facial ridge?

Ans: The part of the bone which overlies facial nerve canal (vertical segment) is called facial ridge. The ridge should be lowered up to the level of the facial nerve. It is continuous as the posterior buttress.

Q.4: What is bridge?

Ans: It is a part of posterior canal wall which overlies ossicles and notch of Rivinus. In the modified radical mastoidectomy, bridge is removed and facial ridge is lowered down.

Q.5: What are anterior and posterior buttress?

Ans:

Anterior buttress: It is the part of superior bony canal wall meets with anterior canal wall which forms lateral attic wall (scutum).

Posterior buttress: It is part of posterior canal wall where it meets inferior canal wall.

Q.6: During modified radical mastoidectomy, bleeding from bone is controlled by?

Ans: Bleeding from bone in mastoid surgery is controlled by using bone wax or by diamond burr or by bipolar cautery.

Q.7: What are the boundaries of the sinus tympani?

Ans:

- Medial to vertical segment of the facial nerve
- Lateral to postextension of promontory
- Inferior to ponticulus and pyramidal eminence
- Superior to subiculum

Ponticulus: A bony bridge located between the posterior tympanic wall and the promontory.

Subiculum: Bony ridge located between the styloid eminence to lip of the round window ridge.

Q.8: What are the boundaries of the facial recess?

Ans:

- Medially by facial nerve
- Laterally by tympanic annulus and chorda tympani nerve
- Superiorly by short process of incus

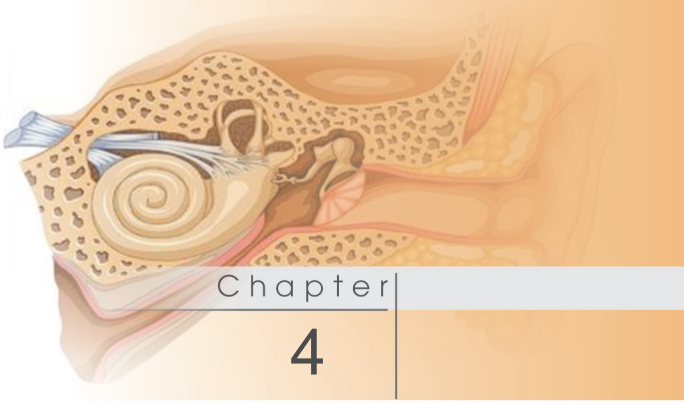
This is a triangle: The corresponding part in the mastoid antrum is called antrum threshold angle.

Q.9: What is COG?

Ans: It is a bony or fibrous ridge extends from cochleariform process to tegmen. Facial nerve lies anterior to the cog just before turns into first genu.

Q.10: What is Prussak's space?

Ans: It lies medial to pars flaccida, lateral to the neck of malleus and above kateral process of malleus. Anteriorly, posteriorly and superiorly, it is bounded by lateral malleal ligament. Posteriorly, it also has a gap through which the space communicates with epitympanum.



Chapter 4

Facial Nerve

CASE 1: FACIAL NERVE PALSY

Presenting complaints: A 45-year-old lady presents with inability to close his right eye completely since 2 days.

Setting: OPD.

History of present illness: Patient was alright 2 days back. Infront of mirror, patient saw unable to close the right eyelids completely (Fig. 4.1). She also notices that people at home say her smile is one sided and she finds it is difficult to retain food in the mouth on the right side. No history of ear discharge, no vertigo and no tinnitus.

History of past illness: Patient has no history of trauma and no history of ear discharge.

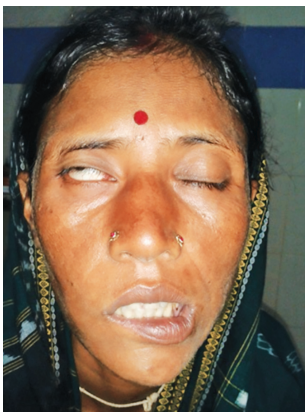


Fig. 4.1: Patient is unable to close her right eye

Q.1: What is the most possible diagnosis?

Ans: Bell's palsy.

Q.2: What are the clinical presentations of Bell's palsy?

Ans: Absence of wrinkling of forehead on the affected side. Inability to close the upper eyelid. Eyeball rolls upward in attempted closure of eye (this protective mechanism is called **Bell's phenomenon** and this is called **Bell's sign**). Absence of nasolabial fold on affected side. Deviation of angle of mouth to the normal side.

Q.3: What are the topographic tests for facial nerve?

Ans: Schirmer's test, stapedial reflex, taste test and submandibular salivary flow test.

Q.4: What are causes of bilateral concurrent facial paralysis?

Ans: Guillain-Barre's syndrome, leukemia, sarcoidosis, Lyme's disease, rabies, infectious mononucleosis, Moebius syndrome.

Q.5: What are the causes of recurrent facial palsy?

Ans: Idipathic (Bell's palsy), Melkersson-Rosenthal syndrome, herpes simplex type I, tumor of VII nerve ipsilateral recurrence seen in malignant tumors contralateral recurrence is seen in benign tumor.

Q.6: What are the treatments for Bell's palsy?

Ans:

General: Reassurance to the patient, eye care and physiotherapy.

Medical treatment: Steroids—adult dose of prednisolone 1 mg/kg/day in divided dose tapered in 15 days. Along with steroid, vasodilators, vitamins and symptomatic treatment will be given.

Surgical treatment: Facial nerve decompression relieves pressure on the nerve fibers and improves microcirculation of the nerve.

CASE 2: FACIAL NERVE PARALYSIS

Presenting complaints: A 35-year-old man presents with hyperacusis, loss of lacrimation and loss of taste sensation in the anterior 2/3rd of tongue since 15 days.

Settting: Out patient department.

History of present illness: He was apparently alright 15 days back. He developed the above clinical manifestations with sudden onset.

History of past illness: No history of hypertension, DM, TB.

Otoscopic examination: Normal external auditory canal and tympanic membrane.

Q.1: What is the site of lesion in facial nerve?

Ans: Lesion proximal to geniculate ganglion.

Q.2: What are the explanations for above clinical manifestations?

Ans: Hyperacusis is due to involvement of nerve to stapedius which arises from vertical part of facial nerve. Loss of lacrimation is due to involvement of greater superficial petrosal nerve which arises from geniculate ganglion. Loss of taste sensation in anterior 2/3rd of tongue is due to involvement of chorda tympanic nerve which arises from vertical segment of facial nerve.

Q.3: What are the topodiagnostic tests for identifying the lesion of the facial nerve in intratemporal part?

Ans: Schirmer test, stapedial reflex, taste test and submandibular salivary flow test.

Schirmer test: This test compares lacrimation of the two sides. Decrease lacrimation indicates lesion proximal to the geniculate ganglion as the secretomotor fibers to lacrimal gland leave at the geniculate ganglion via greater superficial petrosal nerve.

Stapedial reflex: Stapedial reflex is lost in facial nerve lesion above the nerve to stapedius. It is tested by tympanometry.

Taste test: Impairment of taste indicates lesion above the chorda tympani.

Submandibular salivary flow test: Decreased salivation indicates injury above the chorda tympani.

Q.4: What are the branches of the facial nerve?

Ans:

The different branches of facial nerve are:

- Greater superficial petrosal nerve.
- Nerve to stapedius.
- Chroda tympani nerve.
- Communicating branch which joins auricular branch of vagus and supplies the concha, retroauricular groove, posterior meatus and outer surface of tympanic membrane.
- Posterior auricular nerve (supplies the muscles of pinna, occipital belly of occipitofrontalis and communicates with auricular branch of vagus.
- Muscular branches to stylohyoid and posterior belly of digastrics.
- Peripheral branches (temporal, zygomatic, buccal, mandibular and cervical).

Q.5: What is cartilaginous pointer?

Ans: Cartilaginous pointer is a landmark for parotid surgery. The facial nerve lies deep and slightly anterior and inferior to the pointer. Cartilaginous pointer is a sharp triangular piece of cartilage of the pinna and points to the facial nerve.

CASE 3: TRAUMATIC FACIAL NERVE PARALYSIS

Presenting complaints: A 25-year-old boy presenting with facial nerve palsy in right side and vertigo after a road traffic accident.

Q.1: What is the most possible type of fracture of temporal bone?

Ans: Transverse fractures of temporal bone.

Q.2: What is transverse fracture of temporal bone?

Ans: It results from frontal or occipital blow to head and is more likely to cause injury to the labyrinth and facial nerve. This is the less common than longitudinal fracture of the temporal bone.

Q.3: What is longitudinal fracture of temporal bone?

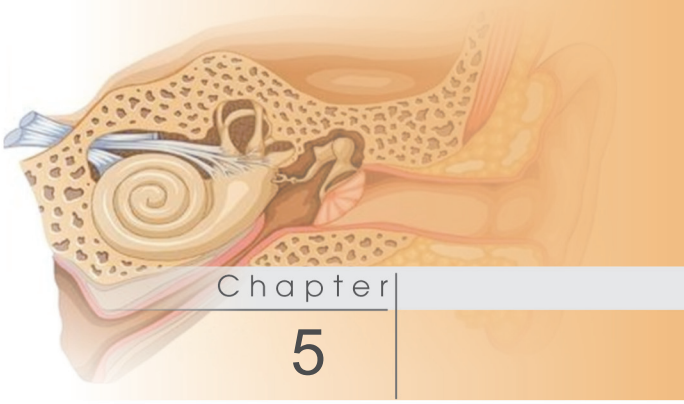
Ans: They occur due to a blow the side of the head and have less chances of facial palsy. They cause conductive hering loss.

Q.4: What is concussion of labyrinth?

Ans: The most common cause of high frequency sensorineural hearing loss in cases of head injury is labyrinthine concussion.

Q.5: What is Battle's sign?

Ans: Ecchymosis seen over the mastoid in cases of temporal bone fracture.



Chapter 5

Otosclerosis

CASE 1: OTOSCLEROSIS

Presenting complaints: A 28-year-old lady presented with hearing loss since 2 years.

Setting: Out patient department.

History of present illness: She is complaing hearing loss since her pregnancy. Hearing loss in both sides and slowely progressive in nature. No history of ear discharge.

Family history: History of hearing loss in mother of the patient in young age.

Pure tone audiogram: Conductive hearing loss and bone conduction curve showing notch at 2000 Hz (Fig. 5.1).

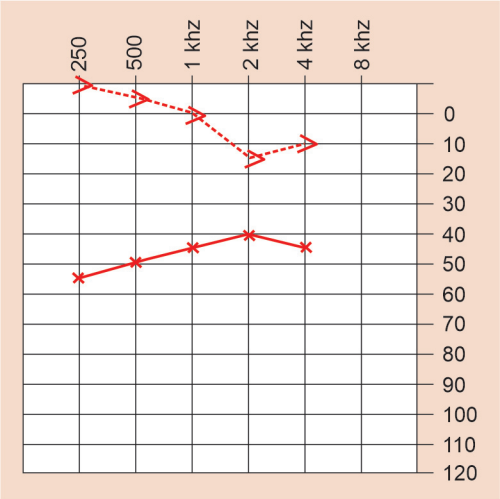


Fig. 5.1: Pure tone audiogram of the patient

Q.1: What is the most likely diagnosis?

Ans: Otosclerosis.

Q.2: What is paracusis Willisii?

Ans: Patient of otosclerosis hears better in noisy environment. This is because in noisy surrounding people tend to raise their voice which is well above the threshold

of hearing for the patient. More importantly this patients donot perceive the background noise, which act as masking noise in normal individuals.

Q.3: What are the examination findings in otosclerosis?

Ans: Commonest tympanic membrane finding is a normal tympanic membrane. In 2–10% cases, the active otosclerotic focus that leads to vascularization of promontory is visualized as a flaming pink discoloration of the tympanic membrane, called **Schwartze's sign**. Surgery is usually contraindicated in patients with positive Schwartze's sign and is an indication for sodium fluoride therapy.

Q.4: What are the audiological findings in otosclerosis?

Ans: Pure tone audiogram shows conductive hearing loss with Carhart's notch (dip at 2000 Hz in bone conduction curve). Tympanometry shows As type of curve. Stapedial reflex is absent once the foot plate is fixed.

Q.5: What are the pathological changes in otosclerosis?

Ans: Mature lamellar bone is replaced by immature spongy bone of more cellularity and vascularity. This changes mainly occurs in the endochondral layer of otic capsule where islands of cartilage are left unossified during development. This spongy bone later on undergoes neo-osteogenesis. Both osteoblastic and osteoclastic activities take place in the otosclerotic process that starts as finger like invasion along the blood vessels. These are sometimes called 'blue mantles' (blue mantles of Manasse) since they appear blusih on H&E staining.

Q.6: What are the differential diagnoses of otosclerosis?

Ans: Otosclerosis should be ruled out from other causes of conductive hearing loss, like

- Secretory otitis media
- Adhesive otitis media
- Tympanosclerosis
- Fixation of head of malleus
- Ossicular discontinuity
- Congenital stapes fixation

Q.7: What is Carhart's notch?

Ans: The puretone audiogram in otosclerosis shows conductive hearing loss. The bone conduction is normal. In some cases, there is dip in bone conduction curve. It is different at different frequencies but maximum at 2000 Hz and it is called Carhart's notch. There is 5 dB at 500Hz, 10 dB at 1000 Hz, 15 dB at 2000 Hz and 5 dB at 4000 Hz. Carhart's notch disappears after successful stapedectomy.

Q.8: What are the findings in tuning fork tests in otosclerosis?

Ans: Tuning fork tests show negative Rinne (first for 256 Hz and then 512 Hz and still later, when stapes fixation is complete, for 1026 Hz). Weber test will be lateralized to the ear with greater conductive hearing loss side. Absolute bone conduction may be normal but it is decreased in cochlear ototaclerosis with sensorineural hearing loss. Gelle's test is negative in otosclerosis.

CASE 2: OTOSCLEROSIS

Presenting complaits: A 32-year-old lady complaints with bilateral decrease hearing since 3 years.

Setting: Out patient department.

Examination: Normal tympanic membrane.

Audiological profile: PTA shows bilateral conductive hearing loss. Impedence audiometry shows As type of curve. Stapedial reflexes are absent in both sides.

Q.1: What is the surgical treatment?

Ans: Stapedotomy (Fig. 5.2).

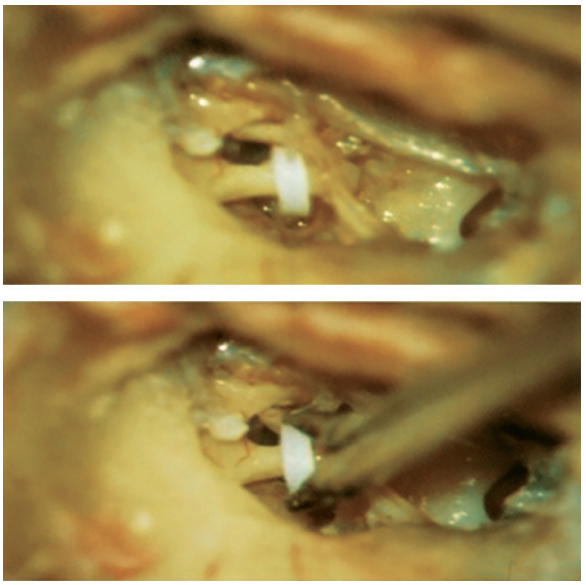


Fig. 5.2: Stapedotomy

Q.2: What are the contraindications for surgery?

Ans: Only hearing ear (absolute contraindication), active/malignant otosclerosis, professionals like pilots, airmen and deep water divers. Pregnancy and extremes are also contraindications.

Q.3: Patient of stapedotomy developed vertigo, tinnitus, aural fullness and fluctuant hearing loss. What may be the cause?

Ans: Perilymph fistula. It is due to a large fenestra, slippage of prosthesis or barotraumas. It is a potentially dangerous complication due to the risk of meningitis and sensorineural hearing loss.

Q.4: What are the treatment options other than surgery?

Ans: Hearing aid is a valuable alternative to surgery. If patient want to avoid surgery or unfit for surgery, hearing aid is a better option. Medical treatment with sodium fluoride is indicated in active otosclerotic focus and malignant otosclerosis (rapidly progressive cochlear otosclerosis).

Q.5: What are the complications of stapedectomy?

Ans:

- Floating footplate (mostly iatrogenic)
- Perilymph fistula
- Sensorineural hearing loss
- Perforation of tympanic membrane
- Vertigo
- Injury to chorda tympani nerve (dysgeusia)
- Labyrinthitis
- Conductive hearing loss due to dislocation of the piston.

Q.6: What is neostapedectomy procedure?

Ans: The stapedectomy where stapedial tendon and incudostapedial joint are preserved.

Q.7: What are the clinical profiles of otosclerosis?

The clinical profiles of the otosclerosis are:

- Progressive conductive deafness
- Age: 20-40 years
- Females more than males (2:1)
- Commonly bilateral (70%)
- Familial tendency present (50%)
- Paracusis Willsii (patient hears better in noisy environment)
- Normal tympanic membrane
- Advanced case may have sensorineural deafness (due to cochlear involvement)
- Flamingo red sign in active otosclerosis (Schwartz sign)
- Pathology: Replacement of normal lamellar bone by spongy vascular bone increased cellularity and density which fixes the foot plate of stapes
- Treatment: Stapedotomy/hearing aid

CASE 3: VAN DER HOEVE SYNDROME

Presenting symtpoms: A young girl of 20 years of age has presented with blue sclera, fragile bone and conductive deafness.

Examination: Bilateral external auditory canal and tympanic membrane are normal.

Q.1: What is the diagnosis?

Ans: Van der Hoeve syndrome.

Q.2: Which bony disease may be associated with otosclerosis?

Ans: Otosclerosis may be associated with osteogenesis imperfecta with history of multiple fractures. The triad of symptoms of osteogenesis imperfecta, otosclerosis and blue sclera is called van der Hoeve syndrome. Lesions of the otic capsule found in osteogenesis imperfecta are histologically indistinguishable from those of the otosclerosis and both are due to genes encoding type I collagen.

Q.3: Which viral infections are thought to be the etiology for otosclerosis?

Ans: Electron microscopic and immunohistochemical studies have shown RNA related to measles virus. It is likely that otosclerosis is a viral disease as has been suggested for paget's disease.

CASE 4: STAPEDOTOMY

Presenting complaints: A 30-year-old lady underwent stapedotomy in the right ear for otosclerosis. Her hearing improved just after the surgery.

Q.1: What is postoperative care advised to the patient?

Ans: Antibiotics and anti-inflammatory drugs should be prescribed. Patient is advised to avoid flying, swimming, straining or lifting heavy weight and sneezing.

Q.2: How definite diagnosis of the otosclerosis can be made?

Ans: Exploratory tympanotomy is helpful for giving definite diagnosis of the otosclerosis and not by CT scan or impedence audiometry.

Q.3: What are the selection criteria of patients for stapedotomy?

Ans:

- Hearing threshold for air conduction should be 30 decibel or worse. It is this level when patient starts feeling socially handicap.
- Average air-bone gap should be at least 15 decibel with Rinne negative for 256 and 512 Hz.
- Speech discrimination score should be 60% or more.

Q.4: What is the role of sodium fluoride in otosclerosis?

Ans: Sodium fluoride therapy has a role in helping maturity of active focus to arrest cochlear loss.

Q.5: Which crus of stapes is long and thick?

Ans: Posterior crus is long, thick and curved in comparision to anterior crus.

Q.6: What is Bezold's triad?

Ans: Bezold's triad is seen in otosclerosis and consists of negative Rinne's, prolonged bone conduction and raised lower tone limit.

Chapter 6

Trauma to Middle Ear

CASE 1: TRAUMATIC PERFORATION OF THE TYMPANIC MEMBRANE

Presenting complaints: An 8-year-old boy come to ENT OPD with complaints of hearing loss after he was slapped in class one day back.

Examination: It showed small central perforation with irregular margins. The margin is blood stained.

Q.1: What is the treatment of this condition?

Ans: Treatment of traumatic perforation of tympanic membrane has high probability of spontaneous resolution provided some of the precautions are observed. Topical ear drops are contraindicated in this cases. Patient need to be followed up for observation and the timely advice.

Q.2: What is the next management, if traumatic perforation will not heal?

Ans: Myringoplasty. Myringoplasty is the surgical procedure involving simple repair of tympanic membrane perforation in which no ossicular reconstruction is involved.

Q.3: What is the tympanoplasty?

Ans: It is the surgical procedure which includes eradication of disease from tympanic cavity, reconstruction of hearing apparatus, with/without tympanic membrane grafting and without mastoid exploration.

Q.4: What are the materials used for grafting in myringoplasty?

Ans: Temporalis fascia (most common), tragal perichondrium, fascia lata, vein graft and dura.

Q.5: What are other procedures used for closure of tympanic membrane perforation?

Ans: Cauterization—50% trichloroacetic acid, phenol. Splinting of traumatic perforations, closure of prosthesis like paper disk moistened with 1% phenol in glycerine.

Q.6: What are the different perforations (other than traumatic) in the tympanic membrane and its significance?

Ans:

Types perforations	*Characteristics*	*Site of pathology*	*Significance*
Central	It is seen in pars tensa with a rim of tympanic membrane around the perforation. It can be of different sizes and different quadrants of the pars tensa.	Tubotympanic type of CSOM; discharge is mucoid or mucopurulent.	Signifies mucosal or tubotympanic type of CSOM, Cholesteatoma is uncommon, complications usually absent.
Marginal	Usually seen in the posterosuperior part of the pars tensa; loss of fibrous annulus; bony annulus us exposed; one margin of the perforation is formed by bony annulus and other sides by pars tensa.	Atticoantral type of CSOM; discharge is foetid and purulent. Granulations and blood stained discharge are commonly seen.	It signifies atticoantral/ squamous type of CSOM. Cholesteatoma may be present and various fatal complications may occur
Attic	It is seen in the pars flaccid.	Similar to marginal perforation.	Same as marginal perforation.

Q.7: Sometimes the trauma cause temporal bone fracture along with injury to middle ear. How we will differentiates the different fractures of the temporal bone?

	Longitudinal fracture	*Transverse fracture*
Frequency	Common (80%)	Less common (20%)
Injury type	Parietal blow	Occipital blow
Bleeding from ear	Common	Absent
Fracture line	Parallel to long axis of petrous pyramid	Run across the petrous.
CSF otorrhea	Present	Absent
Hearing loss	Conductive	Sensorineural hearing loss
Vertigo	Less/uncommon	Severe
Facial palsy	Less common	More common

Chapter 7

Middle Ear Tumor

CASE 1: GLOMUS TUMOR

Presenting complaints: A 43-year-old lady presented with hearing loss and pulsatile tinnitus in the right ear since two year.

Otoscopic examination: It showed a red mass in inferior part of the middle ear behind the intact tympanic membrane. The mass blanched on applying positive pressure with siegle pneumatic speculum.

Q.1: What is the most probable diagnosis?

Ans: Glomus tumor. Glomus tumor is a benign, nonencapsulated, slow growing, locally invasive and vascular tumor from the glomus bodies (resembling carotid bodies) are present at dome of jugular bulb, hypotympanum, promontory and along the tympanic plexus, arising from the tympanic branch of IX nerve (Jacobson's nerve). It is also known as chemodectoma as it resembles carotid bodies. Glomus tumor is common in people between 40 and 50 years of age. It is 5 times more common in females.

Q.2: What is the blood supply of the glomus tumor?

Ans: It usually arises from the tympanic branch of ascending pharyngeal artery.

Q.3: How glomus tumors are classified?

Ans:

According to Oldering and Fisch, classification of glomus tumor is:

Type I: Tumor localized to the middle ear cleft.

Type II: Tympanomastoid tumors with no destruction of infralabyrinthine compartment.

Type III: Tumor involving infralabyrinthine region.

Type IV: Tumor with intracranial extension.

Q.4: What are the clinical manifestations of the glomus tumor?

Ans: Slowly progressive conductive hearing loss, tinnitus, otoscopy shows rising sun appearance in case tumor at hypotympanum, Brown's sign is positive (blanching of tympanic membrane after extering positive pressure over tympanic membrane by Seigle's speculum). Bleeding from the ear. Ear pain and facial palsy in tympanomastoid group.

Q.5: What is CT picture in glomus tumor?

Ans: Phlep's sign refers to the absence of the normal crest of bone (Crotch) between the carotid canal and jugular fossa.

Q.6: What is the four vessel angiography and its importance?

Ans: It is done to find out extent of the tumor, compression of internal carotid artery and other associated carotid body tumor or embolization of the tumor. It is helpful in assessing brain perfusion study.

Q.7: What are the treatment options of glomus tumor?

Ans: Surgery is definitive treatment. Radiotherapy in very elderly and inoperable tumor, residual or recurrence. Embolization to reduce vascularity is done preoperatively or in inoperable cases or following radiation.

Surgical procedure depends on the extent of the tumor

Type I: Transmeatal approach and excision.

Type II: Extended facial recess approach.

Type III: Fisch infratemporal fossa approach (lateral approach).

Type IV: Skull base approach and posterior fossa craniotomy.

CASE 2: GLOMUS TUMOR

Presenting complaints: A 28-year-old man presenting with bleeding from ear, tinnitus and progressive deafness.

On examination: Examination, there is a red swelling behind the intact tympanic membrane that blanches on pressure with pneumatic speculum.

Q.1: What is the diagnosis?

Ans: The diagnosis is with typical history and positive Browne's sign (blanching of the tympanic membrane by positive pressure in external auditory canal) is obviously glomus tumor.

Q.2: What is the appearance of the tympanic membrane in glomus tumor?

Ans: Rising sun appearance.

Q.3: What is Aquino's sign?

Ans: Compression of carotid artery leads to blanching of the glomus jugulare tumor.

Q.4: What is the treatment of glomus tumor?

Ans: Surgery is the treatment of choice with preoperative DSA with embolization to reduce vascularity.

Q.5: What is the role radiotherapy in glomus tumor?

Ans: Radiotherapy may be employed in those patients with glomus tumor who are unfit for surgery or in extensive inoperable lesions.

Chapter 8

Meniere's Disease

CASE 1: MENIERE'S DISEASE

Presenting complaints: A 40-year-old man complains dizziness since 3 months.

Setting: OPD

History of present illness: He was apparently alright 3 months back. To start with giddiness of 4 attacks. Each attack was persisting for 2 to 3 hours and associated with nausea and vomiting. He also complained hearing loss, tinnitus and aural fullness.

Past history: He is a known case of hypertension under treatment and nondiabetic. He has no history of ear surgery and no history of noise exposure or ototoxic medications.

Local examination: Pinna, external auditory canal and tympanic membrane are normal in both sides.

Tuning fork test: Rinne positive in both ears whereas Weber lateralize to the right.

Fistula test: Negative.

Q.1: What is the most probable diagnosis?

Ans: Meniere's disease.

Meniere's disease is characterized by episodic vertigo, fluctuating sensorineural hearing loss, tinnitus and aural fullness. Its peak incidence is at age 40 to 60 years. It can also be seen inchildren but less often than adults.

Q.2: What is the pathogenesis of Meniere's disease?

Ans: Pathogenesis is endolymphatic hydrops—fluid distension of the endolymphatic spaces leading to rupture of the membranous labyrinth causes mixing of endolymph and perilymph leads to ionic disturbances, causes clinical manifestations. Hydrophs mainly affect cochlea (scala media), followed by saccule, utricle and semicircular canals. Least affected site is endolymphatic duct and sac.

Q.3: What is Lermoyez syndrome?

Ans: It is a variant of Meniere's disease, where initially there is deafness and tinnitus, vertigo appears later, when deafness improves.

Q.4: What are the characteristic audiometric findings in Meniere's disease?

Ans:

- Pure tone audiogram typically shows low frequency sensorineural deafness initially.

- Since it is a cochlear lesion, there is a high score in SISI indicating recruitment and absent tone decay.
- Electrocochleography shows widening of SP/AP ration (Normal <30%, In Meniere's disease >30–40%).

Q.5: What is the glycerol test and how it is useful in Meniere's disease?

Ans: There is improvement of hearing thresholds and SP/AP ratio after oral administration of glycerol, a dehydrating agent that brings down the hydrops. This is diagnostic and signifies a good prognosis for diuretic therapy and endolymphatic sac shunt surgery.

Q.6: What is the medical management of Meniere's disease?

Ans:

- Low salt diet
- Labyrinthine sedatives
- Diuretics to reduce endolymphatic accumulation
- Stop smoking, limit alcohol and caffeine
- Stress reduction

Q.7: What is Meniett apparatus (Fig. 8.1)?

Intermittent low pressure therapy is used in the pressure treatment of Meniere's disease. After placing a grommet through myringotomy, the apparatus is palced in the canal, which thought to bring down hydrops by influencing the round window membrane pressure receptors and thus bringing down the endolymphatic pressure.

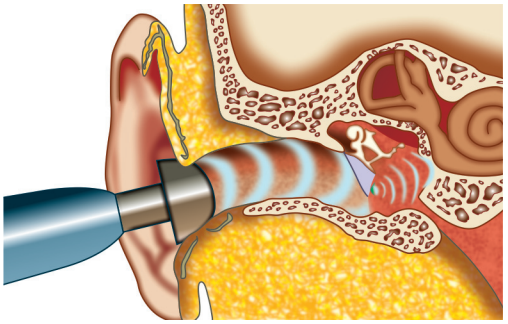


Fig. 8.1: Meniett apparatus

Q.8: What are the hearing conserving surgeries done in Meniere's disease?

Ans: Vestibular neurectomy, endolymphatic shunts surgery, endolymphatic sac decompression.

Labyrinthectomy is the hearing destroying surgery.

Q.9: What is the role of intratympanic gentamicin in Meniere's disease?

Ans: As gentamicin is selectively vestibulotoxic, locally instilled gentamycin in the middle ear can diffuse into the inner ear through the round window membrane, destroying the dark cells of vestibular labyrinth, thus bringing down vertigo. This is

also called medical/chemical layrinthectomy. Though theoretically there is chance of cochlear damage, usually it is negligible. Gentamicin may be instilled into the middle ear by microwick/microcatheter timed release system, kept through a grommet.

Q.10: What are the differential diagnosis of vertigo, tinnitus and sensorineural deafness?

Ans:

- Meniere's disease
- Syphilitic/autoimmune labyrinthitis
- Cogan's syndrome
- Transverse fracture temporal bone
- Perilymph fistula
- Acoustic neuroma/meningioma (CP angle lesion)
- Multiple sclerosis
- Hypothyroidism/hyperlipidemia

Q.11: What are clinical profile of the Meniere's disease?

Ans:

Cardinal symptoms
- Episodic vertigo
- Fluctuating deafness
- Tinnitus

Other symptoms
- Aural fullness
- Nystagmus
- Headache
- Anxiety state

Pathology
- Endolymphatic hydrops

CASE 2: MENIERE'S DISEASE

Presenting complaints: A 48-year-old male presented with sudden onset of rotatory vertigo associated with vomiting since one month. There was sudden onset of aural fullness and tinnitus in the right ear.

History of present illness: There was a history of six episodes of rotatory vertigo during last one month. There was no loss of consciousness, no history of falls, visual symptoms or headache.

History of past illness: The patient was not a known case of diabetic or hypertensive.

Neurological examination: Normal.

Caloric test: Hypoactive response on the right side.

MRI of brain and inner ear: Normal.

Q.1: What is the most possible diagnosis?

Ans: Meniere's disease.

Q.2: What are the important clinical features of Meniere's disease?

Ans: The different clinical features are:

- Age and sex—it occurs in the age group of 40–50 years, men are more commonly affected.
- Unilateral ear involvement is more common (85%).
- Acute exacerbations and remissions are characteristic.
- Vertigo is sudden, severe and occurs in episodes. Patient is normal in between attacks. Sometimes Meniere's disease shows Tullio's phenomenon (noise induced vertigo).
- Hearing loss—progressive, fluctuating sensorineural hearing loss, often exacerbates during attacks.
- Intolerance to loudness (recruitment).
- Diplacusis or distortion of sounds typically perceived by the patient while listening to a telephonic conversation.
- Tinnitus—fluctating, low pitched tinnitus. It may be roaring or hissing type.
- Fullness in ear.
- Nausea and vomiting.

Q.3: What is the genetic basis for Meniere's disease?

Ans: Meniere's disease is autosomal dominant and is more seen in females.

Q.4: What is the gold standard investigation used for diagnosis of Meniere's disease?

Ans: ECoG is the gold standard for diagnosis of Meniere's disease.

Q.5: What are current modes of management in Meniere's disease?

Ans: Dietary salt restriction (1.5–2 gm/day), vestibular suppressants for the acute crisis, alleviation of anxiety and diuretics.

Q.6: What are the other treatment options in Meniere's disease?

Ans: Vestibular rehabilitation therapy enhances and expedites central compensatory mechanisms in the Meniere's disease. Different surgical procedures have evolved for Meniere's disease refractory to medical therapy. These can be in the form of conservative surgeries as in endolymphatic sac surgery or in the form of destructive procedures like labyrinthectomy and vestibular nerve section which result in deafferentation of the vestibular end organ.

Chapter 9

Acoustic Neuroma

CASE 1: ACOUSTIC NEUROMA

Presenting complaints: A 39-year-old male comes to outpatient department of otolaryngology for left sided hearing loss since 3 months.

Examination of ear: Both sides external auditory canal and ear drum are normal.

Pure tone audiometry: It shows left sensorineural hearing loss and absent left corneal reflex.

Imaging: CT scan shows a widened internal auditory meatus.

Q.1: What is the most probable diagnosis?

Ans: Acoustic neuroma.

Q.2: What is the investigation of choice in acoustic neuroma?

Ans: MRI brain with gadolinium enhancement is the investigation of choice in this case.

Q.3: Most common symptoms in acoustic neuroma?

Ans: Progressive bilateral sensorineural (retrocochlear) hearing loss (present in 95% patients) often accompanied with tinnitus (present in 65% patients).

Q.4: Where is the origin of acoustic neuroma?

Ans: It originates in the Schwann cells of the superior or inferior vestibular nerves at the transition zone (**Obersteiner-Redlich zone**) of the central and peripheral myelin.

Q.5: What are the audiological findings in acoustic neuroma?

Ans: It shows features of retrocochlear hearing loss. Recruitment is negative. Speech discrimination score is poor. BERA shows delay of >0.2 msec in wave V between the two sides. Acoustic reflex shows stapedial reflex decay.

Q.6: What are the neurological tests findings in acoustic neuroma?

Ans:

- Reduced corneal reflex
- Facial weakness
- Cerebellar signs
- CSF shows increased proteins
- Fundus examination shows papilledema

Q.7: What are the vestibular symptoms in acoustic neuroma?

Ans:

- Classical vertigo is not seen and vague imbalance may be a feature (although it arises from vestibular nerve, but because of slow growth and central adaptation, true vertigo does not occur).
- Canal paresis is present (response to both hot and cold absent).
- Nystagmus is of first degree.
- Past pointing and positive Romberg's test indicate involvement of cerebellum.
- Ataxia occus, if tumor is very large one.

Q.8: What are the radiological tests done in acoustic neuroma?

Ans:

- Plain X-ray of internal acoustic meatus not very helpful (Towne and Stenver's view).
- CT scan is useful for small to moderate size tumor.
- MRI with gadolinium contrast is the best and gold standard investigation for very small size which may be intracanalicular type.
- Vertebral angiography helps to make differential diagnosis from other CP angle tumors such as meningioma, arachnoid cyst, aneurysm or metastasis.

CASE 2: ACOUSTIC NEUROMA

Presenting complaints: A 50-year-old man comes to ENT OPD with complaints of deafness, headache and tinnitus in the right ear since 6 months and deviation of angle of mouth and inability of to close right eye for last one month.

Past history: There was no history of ear discharge.

Tuning fork test: It showed moderate sensorineural hearing loss in the right ear.

Q.1: What is the most appropriate investigation in this case?

Ans: MRI brain with gadolinium enhancement.

This clinical picture is suggestive of CP angle tumor involving VIIth and VIIIth cranial nerve. Acoustic neuroma is the most common CP angle tumor. MRI with gadolinium enhancement is the investigation of choice.

Q.2: What are pathologies seen in CP angle?

Ans: Acoustic neuroma (most common), meningioma, epidermoid, arachnoid cyst, schwannoma of other cranial nerves (e.g. CN V > VII > IX > X, XI), aneurysm, glomus tumor and metastasis.

Q.3: What is the treatment for acoustic neuroma?

Ans: Surgical removal of the tumor is the treatment of choice. Surgical approach will depend upon the size of the tumor.

Different approaches are:

Middle cranial fossa approach, translabyrinthine approach, suboccipital (retrosigmoid) approach and combined translabyrinthine—suboccipital approach.

Different approaches

- Intracanalicular tumor up to 8 mm size with reasonable hearing—middle cranial fossal approach.
- Intracanalicular tumor with no hearing—translabyrinthine approach.
- Medium size tumor up to 2.5 to 3.5 cm with or without trigeminal nerve involvement—translabyrinthine approach.
- Large tumor of more than 2.5 cm with raised intracranial tension—approach wll be suboccipital decompression combined with translabyrinthine approach.
- Bilateral medium to large tumor with good hearing—treatment would be retrolabyrinthine with preservation of labyrinth.

Q.4: What is gamma knife surgery?

Ans: Gamma knife surgery is not an actual surgical treatment but is done through linear accelerator or by cobalt-60 source. It is a type of stereotactic radiotherapy, which is applied in patients those are not fit for surgery or those refuse surgery. Head is fitted on a frame and high dose radiation is focused onto the tumor. Cyberknife is another modification over gamma knife and is more precise and accurate method and works through computer controlled robotics.

Chapter 10

The Deaf Child

CASE 1: DEAF CHILD

Presenting complaints: A mother presented at the outpatient department of otolaryngology with her 2 years son who is not vocalizing. She also suspects that he is unable to respond to loud noises. The examination of the motor system is normal.

Setting: OPD.

Otoscopy: Bilateral tympanic membranes are normal.

Q.1 What would be the most appropriate test in this child?

Ans: Hearing test (BERA).

Q.2: What is the absolute indication for a hearing aid?

Ans: Absolute indication of hearing aid is congenital deafness, for satisfactory development of speech and language.

Q.3: How hearing aid helps to deaf child?

Ans: It amplifies sound reaching the ear. Best suited for patients with conductive hearing loss. In sensorineural deafness; there may be distortion of sound du to recruitment.

Q.4: What are the measures are taken to reduce recruitment in hearing aids?

Ans: Peak clipping, compression amplification and automatic gain control.

Q.5: What is BAHA?

Ans: Bone-anchored hearing aid. It acts by direct stimulation of cochlea bypassing external and middle ear, since it is anchored to the bone. It is indicated when mixed or conductive hearing loss not benefited by a conventional hearing aid, e.g. ear canal atresia and active CSOM, which precludes wearing of hearing aid.

Q.6: What is Mondini's dysplasia?

Ans: Here the cochlea is 1.5 turns (only basal coil is present). There is incomplete partition between the scalae due to absence of osseus spiral lamina. This type of cochlear deformity is may be seen in Pendred syndrome, Waardenburg syndrome, Treacher-Collins syndrome, Wildervanck syndrome and Branchio-oto-renal syndrome.

Q.7: What are the methods for hearing assessment in infants and children?

Ans:

- Neonatal hearing screening procedures: Arousal test, auditory response test and ABR/OAEs.
- Behavioal observation audiometry: Moro's reflex, cochleopalpebral reflex and cessation reflex.
- Distraction technique.
- Conditioning methods: Visual reinforcement audiometry and play audiometry.
- Objective tests: ABR, OAEs and impedence audiometry.

Q.8: What are essentials for managing the deaf child?

Ans:

- Parental guidance
- Hearing aids
- Speech and language development
- Education to the deaf child.
- Vocational guidance to the deaf child.

Q.9: What is hearing aid?

Ans: Hearing aid is a device which amplify sounds reaching the ear. It consists of three parts: Microphone, amplifier and receiver. Microphone picks up sounds and convert it into electrical impulses. Amplifier magnifies electrical impulses and receiver converts electrical impulses back to sound. This amplified sound is then carried through the earmould to the tympanic membrane and middle ear.

CASE 2: DEAF CHILD

Presenting complaints: A 3-year-old male child presented with severe sensorineural hearing loss was prescribed a hearing aid but showed no improvement.

Setting: OPD.

Hearing test: An infant is not responding to free field stimulation. BERA shows absent waveform in both ear.

Q.1: What is the most possible treatment in above case?

Ans: Cochlear implant.

Absent waveform in both ear in BERA is suggestive of profound hearing loss in this infant. Cochlear implant is the treatment of choice in this case.

Q.2: What is cochlear implant?

Ans: It bypasses the cochlea and acts by stimulating the auditory nerve. It is used in severe to profound hearing loss, where there is irreversible damage to the hair cells.

Q.3: In cochlear implants, electrodes are placed in?

Ans: Commonest site of electrode placement in cochlear implant is the scala tympani of the cochlea. Round window is a route of access into the cochlea in those cases where a separate cocheostomy is not drilled out.

Q.4: What are the parts of the cochlear implant?

Ans: External components: It consists of external speech processor and a transmitter. The speech processor may be body worn or behind the ear type. Internal component: It is surgically implanted and comprises the receiver/stimulator package with an electrode array.

Q.5: What are criteria of candidates for cochlear implant?

Ans: Cochlear implant may be done in children and adults. The criteria for candidacy of cochlear implantation are:

- Bilateral severe to profound sensorineural hearing loss.
- Little or no benefit from hearing aids.
- No medical contraindication for cochlear implant surgery.
- Realistic expectation from cochlear implant.
- Adequate cognitive function to be able to use the device.

Q.6: What are the preoperative evaluations for cochlear implant?

Ans: Different preoperative evaluations are:

- Imaging of the temporal bone, cochlea, auditory nerve and brain is carried out by CT and MRI.
- Audiological evaluation include pure tone audiometry, speech audiometry, tympanometry, otoacoustic emissions (OAE), auditory brainstem responses (ABR) and auditory steady state responses (ASSR).
- All candidates must be fully vaccinated against meningitis particularly *Haemophilus influenzae* type B, Pneumococcus and Meningococcus.

CASE 3: WAARDENBURG SYNDROME

Presenting complaints: The parent of a 4-year-male child brought the child to outpatient department of ENT with complaint of hearing loss since birth.

On examination: The child has white forelock, vitiligo and heterochromia iridis.

Pure tone audiometry: Bilateral severe sensorineural hearing loss.

Q.1: What is the most possible diagnosis?

Ans: Waardenburg syndrome.

Q.2: What is Waardenburg syndrome?

Ans: It is an autosomal dominant disorder where patient presents with unilateral or bilateral sensorineural hearing loss, white forelock, heterochromia iridis, vitiligo and dystopia canthorum.

Q.3: What is Usher syndrome?

Ans: Child present with sensorineural hearing loss, retinitis pigmentosa, night blindness. It is an autosoma recessive disorder.

CASE 4: CROUZON SYNDROME

Presenting complaints: A 5-year-old male child presents with hearing loss in both ear, exophthalmos with divergent squint (frog eye), hypertelorism, parrot-

beak nose and mandibular prognatism since birth. He is also a mentally challenged child.

On examination: This child has premature closure of the cranial sutures.

Pure tone audiometry: Conductive or mixed hearing loss.

Q.1: What is the most possible diagnosis?

Ans: Crouzon syndrome.

Q.2: What is Crouzon syndrome?

Ans: It is an autosomal dominant disorder with conductive or mixed hering loss. The patient has frog eyes (exophthalmos with divergent squint). The child has parrot beak nose, hypertelorism, mandibular prognathism and premature closures of the cranial sutures.

Chapter 11

Hearing Loss

CASE 1: HEARING LOSS

Presenting complaints: A 30-year-old man presents with hearing loss in right ear following an accident.

Setting: OPD.

On otoscopic examination: The tympanic membrane was normal and pure tone audiometry shows an air-bone gap of 50 decibel in the right ear with normal cochlear reserve.

Q.1: What will be the type of tympanogram in above case and diagnosis?

Ans: Ad type tympanogram. The diagnosis is ossicular disruption.

Q.2: What are average hearing losses in different lesions of conductive apparatus?

Ans:

Complete obstruction of ear canal: 30 decibel.

Perforation of tympanic membrane: 10–40 decibel.

Ossicular interruption with intact ear drum: 54 decibel.

Ossicular interruption with perforation: 10–25 decibel.

Closure of the oval window: 60 decibel.

Q.3: What are the types of tympanogram?

Ans:

Type A: Normal tympanogram.

Type As: Low compliance tympanogram seen in otosclerosis.

Type Ad: High compliance tympanogram seen in ossicular discontinuity or laxed tympanogram.

Type B: Flat/dome-shaped tympanogram seen in middle ear fluid or thick tympanic membrane.

Type C: Negative compliance tympanogram seen in retracted tympanic membrane.

Q.4: What is the commonest cause of conductive hearing loss in children?

Ans: Secretory otitis media (middle ear effusion) is the most common cause of conductive hearing loss in children.

Q.5: What are the causes of sensorineural hearing loss?

Ans: Different causes of sensorineural hearing loss are:

- Presbyacusis
- Ototoxicity
- Trauma
- Noise induced hearing loss
- Genetic
- Systemic diseases like diabetes, syphilis and hypertension
- Sudden idiopathic hearing loss
- Meniere's disease
- Acoustic neuroma.

Q.6: What are the lesions of external auditory canal causing conductive hearing loss?

Ans: The lesions are:

- Occlusion of lumen due to wax, fungus and foreign body.
- Narrowing of external auditory canal due to exostosis, bony stenosis and congenital atresia.

Q.7: What are the differences between conductive hearing loss and sensorineural hearing loss?

Ans:

Conductive hearing loss	*Sensorineural hearing loss*
• Disease is limited to external ear, middle ear up to footplate of stapes	• Disease is beyond the oval window
• Rinne test is negative	• Rinne test is positive
• Weber is lateralized to worse ear	• Weber is lateralized to better ear
• Absolute bone conduction (ABC) is normal	• ABC shortened
• Pure tone audiometry shows air bone gap	• Pure tone audiometry shows no air bone gap
• Low frequencies are involved	• High frequency hearing loss
• Hearing loss up to 50–60 dB	• Poor speech discrimination score
• Speech discrimination score is good (95–100%)	• Recruitment test is positive in cochlear lesions
• Recruitment is negative	• SISI score is more than 60% in cochlear lesions.
• Short increment sensitivity index (SISI) is around 15%	• A tone decay of 30 dB is seen in retrocochlear lesions
• No tone decay	
• Impedence audiometry is a useful test	• Impedence audiometry is not of much use
• BERA has not much use	• BERA is a very useful diagnostic tool

Q.8: What are the differences between cochlear and retrocochlear types of sensorineural hearing loss?

Cochlear SNHL	*Retrocochlear SNHL*
• Hair cells of cochlear are damaged	• Lesions in the 8th nerve or its central connections
• Recruitment is positive	• Recruitment is absent
• SISI score is high/positive	• SISI score is less/negative
• No significant tone decay	• Tone decay is significant
• Bekesy shows no gap between I and C tracing (type II)	• Bekesy shows wide gap between I and C tracing (type III)
• Speech discrimination is not highly impaired and no roll over phenomenon is seen	• Speech discrimination score is poor and roll over phenomenon is present
• Subjective feeling of hyperacusis, diplacusis or fullness in the ear	• No such sensation or feeling found

CASE 2: HEARING LOSS

Presenting complaint: A 32-year-old gentleman reports of decreased hearing in the right ear for last two years.

Tunign fork test: On testing with a 512 Hz tuning fork the rinne's test without masking is negative on the right ear and positive on the left ear. With the Weber's test the tone is perceived as louder in the left ear.

Q.1: The most likely patient has what type of hearing loss?

Ans: Patient has right side severe sensorineural hearing loss. There is false negative Rinne test in the right side.

Q.2: Why 512 Hz tuning fork is most commonly used for hearing assessment?

Ans: 512 Hz tuning fork is used for hearing assessment as it has longer tone decay and sound is quite distinct from ambient noise. Tuning fork of low frequencies produce sense of bone vibration while those of higher frequencies have a shorter decay time and so not used routinely. The sound of frequency 512 Hz tuning fork falls in speech range.

Q.3: Gelle's test is done in _____?

Ans: Otosclerosis.

Gelle's test was once a popular test to find out stapes fixation in otosclerosis but now has been superceeded by tympanometry. In this test, bone conduction is tested and at same time Siegel's speculum compresses the air in the external auditory canal. If hearing is reduced when the air is compressed, test is positive. If there is no change in hearing, it is negative. Gelle's test is positive in normal indiviuals and sensorineural hearing loss. Gelle's test is negative in otosclerosis.

CASE 3: HEARING LOSS

Presenting complaints: A 28-year-old lady presenting with bilateral hearing loss since 4 years which worsened during pregnancy.

Pure tone audiometry: Revealed bilateral conductive hearing loss

Q.1: What is the type of impedence audiometry graph will be?

Ans: Type As.

Q.2: What is the diagnosis?

Ans: Bilateral conductive hearing loss, female patient, 28 years of age and attenuation of hearing loss during pregnancy indicate the diagnosis of otosclerosis.

Q.3: What are the different curves of impedence audiometry?

Ans:

Types of curves	*Clincial conditions*
A type curve	Normal
As type curve	Otosclerosis Tumors of middle ear Fixed malleus syndrome Tympanosclerosis
Ad type curve	Ossicular discontinuity Poststapedectomy
B type curve (flat or dome shaped curve)	Fluid in middle ear Tympanic membrane perforation Secretory otitis media Grommet in ear
C type curve	Retracted tympanic membrane Eustachian tube dysfunction

CASE 4: HEARING LOSS IN NEWBORN

Presnting complaints: A 6-month-old baby presented no response to sound. Parents of the baby brought the baby to ENT OPD for hearing assessment.

Q.1: Which is the investigation of choice for assessement of hearing loss?

Ans: Brainstem evoked response audiometry (BERA)

Q.2: What is BERA?

Ans: It is a non-invasive procedure which helps to find out the integrity of central auditory pathway through the VIII nerve, pons and midbrain. It is the most reliable audiological method of differentiating between cochlear and retrocochlear hearing loss. It is an objective test and can be done under sedation. It is used both as a screening test and as a definite test for hearing assessment in children. It is the best investigation for hearing in infants, mentally retarded child and malingering subjects. It is also used to identify the site of lesion in retrocochlear pathologies.

Q.3: What is free field audiometry?

Ans: This test is dependent upen the localizing powers of child, that develops at 6 months of age. It is assessed by placing the child in between 2 calibrated loudspeakers in a sound treated room and finding out whether the child is turning its head to direction from which the sound is coming.

Q.4: What is behavior observation audiometry (BOA)?

Ans:

- This hearing test rely on judgment made by subjects are described as subjective and/or behavioral since they depend for reliability on responses of an alert, cooperative and instructed patients.
- Here, audiometry signal presented to an infant produces a change in behavior e.g. alerting, cessation of an activity, widening of eyes or facial grimacing. Moro's reflex is one of them and consists of sudden movement of limbs and extension of head in response to sound of 80–90 decibel. In cochleaopalpebral reflex, the child responds by a blink to a lound sound. In cessation reflex, an infant stops activity or starts crying in response to a sound of 90 decibe.

CASE 5: HEARING LOSS AFTER HEAD TRAUMA

Presenting complaints: A patient has presented with unilateral conductive deafness. There is history of head trauma.

Examination: The tympanic membrane is normal in appearance.

Q.1: What is the etiology of the conductive hearing loss in this case?

Ans: Ossicular chain disruption

Q.2: What is the type of tympanogram in ossicular discontinuity?

Ans: Type Ad. There will be high compliance at or near ambient pressure.

Q.3: What is the quantity of conductive hearing loss in ossicular disruption?

Ans: 38 to 54 decibel.

The amount of conductive hearing loss in:

- External auditory canal closure—30 decibel.
- Perforated tympanic membrane—10 to 40 decibel.
- Oval window closure—60 decibel. The maximum conductive deafness is 60 decibel.

Q.4: Commonest cause of conductive hearing loss in adult?

Ans: Wax

Commonest cause of conductive hearing loss in children is secretory otitis media.

Q.5: What is deafness and causes of deafness?

Ans: Deafness is due to defective transmission or abnormal perception of the sound wave. The causes may be in the external, middle and inner ear mechanism which are given in Table. 11.1

Table 11.1: Deafness: External, middle and inner ear causes

External ear	*Middle ear*	*Inner ear*
Wax	Otosclerosis	Presbycusis
Atresia	Otitis media	Meniere's syndrome
Otitis externa	Trauma	Noise trauma
Foreign body	Tumor	Viral infection
Trauma	Congenital	Ototoxicity
Tumor		Labyrinthitis
		Vascular
		Congenital
		Idiopathic

CASE 6: HEARING LOSS IN CHILDREN

Presenting complaints: A child of 6 years suffering from bilateral conductive deafness detected on school screening.

Q.1: What is the commonest cause of hearing loss in this case?

Ans: Glue ear or otitis media with effusion.

Q.2: What are other names of the glue ear?

Ans: The synonyms of the glue ear are:

- Otitis media with effusion
- Nonsuppurative otitis media
- Chronic secretory otitis media
- Chronic serous otitis media
- Mucoid otitis media
- Silent otitis media

Q.3: What are the audiological profile in glue ear?

Ans:

- Tuning fork test: Conductive hearing loss
- Pure tone audiometry: Conductive hearing loss
- Imedence audiometry: B-type curve

NB: Fluctuating deafness of conductive nature is seen in secretory otitis media, while fluctuating sensorineural hearing loss is a feature of Meniere's disease.

Pneumatic otoscopy (Siegalization) is the gold standard for the diagnosis of otitis media with effusion/glue ear. On gentle pressure on the bulb, tympanic membrane will not move, if an effusion is present. Presence of the middle ear fluid is mandatory for the diagnosis of the glue ear and that can be confirmed by pneumatic otoscopy or tympanometry.

Q.4: What are the otoscopic pictures in the glue ear?

Ans:

- Tympanic membrane appears dull
- Light reflex is absent

- Tympanic membrane is retracted and restricted
- Fluid levels and air bubbles are seen through tympanic membrane
- Potbelly tympanic membrane is a feature of glue ear.

Q.5: What are the treatment options in glue ear?

Ans:

Medical

- Topical decongestants
- Antiallergics
- Antibiotics

Surgical

- Treatment of choice—myringotomy and grommet insertion
- Surgical management of causative factors, i.e. adenoidectomy/tonsillectomy.

CASE 7: TUNING FORK TEST

Presenting complaints: A 35-year-old man reports of decreased hearing in the right ear for last 2 years.

Tuning fork test: With 512 Hz tuning fork, the Rinne's test (without masking) is negative on the right ear and positive on the left ear. With the Webner's test the tone is perceived louder in the left ear.

Q.1: What is the most possible diagnosis?

Ans: Right sensorineural hearing loss. Rinne's test in this case is false negative.

Q.2: What is false negative Rinne test?

Ans: It is seen in severe unilateral sensorineural hearing loss. During performing Rinne test, patient does not perceive any sound of tuning fork by air conduction but responds to bone conduction testing. This response to bone conduction is, in reality, from the opposite side because of the transcranial transmission of the sound. In such cases, correct diagnosis can be done by masking the non-test ear with Barany's noise box while testing for bone conduction. Weber test will further help as it gets lateralized to the better ear.

Q.3: How to get degree of hearing loss from Rinne test?

Ans: For knowing degree of hearing loss, three tuning forks are required such as 256,512 and 1024 Hz.

- A Rinne test equal or negative for 256 Hz but positive for 512 Hz indicates air-bone gap of 20–30 dB.
- A Rinne test negative for 256 and 512 Hz but positive for 1024 Hz indicates air-bone gap of 30–45 dB.
- A Rinne negative for all the three tuning forks of 256,512 and 1024 Hz indicates air-bone gap of 45–60 dB.

CASE 8: TYMPANOGRAM

Presenting complaints: A 26-year-old lady suffering from bilateral hearing loss for 6 years which become profound with pregnancy.

Q.1: Which type of tympanogram will be obtained in this case?

Ans: Bilateral hearing loss getting worse in pregnancy is due to otosclerosis. Tympanogram in this case would be As type. It is a normal tympanogram with reduced compliance due to stapes fixation.

Q.2: What is type A tympanogram?

Ans: It is high compliance at or near ambient pressure. This is seen in ossicular discontinuity or thin and lax tympanic membrane.

Q.3: What is type B tympanogram?

Ans: This is a flat or dome-shaped graph (Fig. 11.1). No change in compliance with pressure changes. It is seen in middle ear fluid or thick tympanic membrane.

Q.4: What is type C tympanogram?

Ans: Here, maximum compliance occurs with negative pressure in excess of 100 mm H_2O. It is seen in retracted tympanic membrane and may show some fluid in the middle ear.

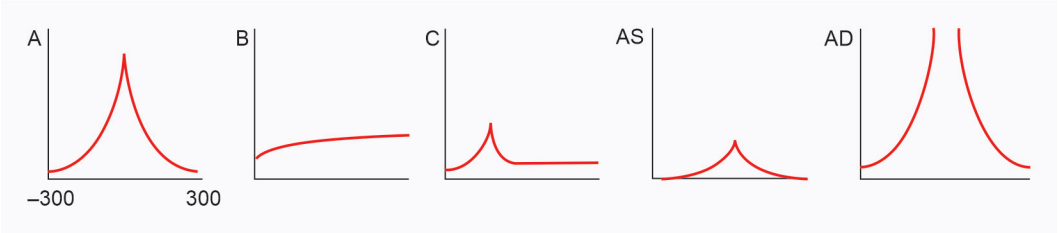


Fig. 11.1: Different types of tympanogram

CASE 9: NOISE INDUCED HEARING LOSS

Presenting complaints: A 35-year-old man work in a factory with exposure to noise and presented with hearing loss since one month.

Pure tone audiometry: Audiogram showed bilateral symmetrical sensorineural hearing loss with noth at 4000 Hz.

Q.1: What is the possible diagnosis?

Ans: Noise induced hearing loss

Q.2: What is the noise induced hearing loss?

Ans: Noise induced hearing loss is a major cause of preventable sensorineural hearing loss (SNHL). SNHL may follow chronic exposure of noisy occupations, which are less intense sounds than the acoustic trauma.

Q.3: What is acoustic trauma?

Ans: A single brief exposure to a very intense sound such as an explosion, gunfire or a powerful cracker can result in permanent damage to hearing. Sudden loud sound has the potential to damage outer hair cells, organ of Corti, Reissner's membrane, tympanic membrane and ossicular chain.

Q.4: What are the pathology in noise induced hearing loss?

Ans: Noise induced hearing loss damages hair cells, which begin at the basal turn of cochlea. Outer hair cells are affected earlier than inner hair cells.

Q.5: What are preventable measures for noise induced hearing loss?

Ans: Noise induced hearing loss is preventable. Persons who have to work at places where noise is above 85 decibel should have pre-employment and then annual audiograms for early detection. Ear protections by ear plugs or ear muffs should be used where noise levels exceed 85 decibel. They provide protection up to 35 decibel. If already hearing loss occur, patient may use rehabilitation with hearing aid.

CASE 10: OTOTOXICITY

Presenting complaints: A 48-year-old man taking aspirin since two years is developing hearing loss for 2 months. He had no history ear discharge.

On examination: Bilateral external auditory canal and tympanic membrane are normal.
Pure tone audiometry: Bilateral moderate sensorineural hearing loss.

Q.1: What is the most possible diagnosis?

Ans: Ototoxicity.

Q.2: What are the cochleotoxic drugs?

Ans:

- Dihydrostreptomycin
- Neomycin
- Amikacin
- Ethacrynic acid
- Cisplatin
- Salicylates
- Kanamycin
- Tobramycin
- Furosemide
- Bumetanide
- Nitrogen mustard
- Quinine

Kanamycin is cochleotoxic and most likely to cause unilateral hearing loss.

Sensorineural hearing loss due to quinine, salicylates and furosemide is reversible if drug stopped early.

Q.3: What are the vestibulotoxic drugs?

Ans: Streptomycin, gentamicin and minocycline.

- Streptomycin and gentamicin affect vestibular end organs, causing severe damage to sensory epithelium of cristae of all the semicircular canals.
- Minocycline causes reversibe vestibular symptoms like gait disturbances, nausea and vomiting but no nystagmus.

Q.4: How ototoxic drugs cause cochlear damage?

Ans: In general, outer hair cells are more vulnerable to ototoxicity than the inner hair cells. In aminoglycoside ototoxicty, outer hair cells of basal turn are affected first and then damage spreads to apical turn. Once most of the outer hair cells are damaged, damage to inner hair cells proceeds in reverse order from apex to base.

Chapter 12

Vertigo

CASE 1: VESTIBULAR NEURONITIS

Case Presentation

A 60-year-old housewife presented with complaints of severe rotator, spinning sensation since one week. She had nausea and vomiting during the episodes. She had also istability on walking since one week. After taking by a general practioner, she had an improvement in her symptoms. However, instability while walking persisted. She had no hearing loss or tinnitus.

Past History

- She is not diabetic and hypertensive.
- She was not taking any ototoxic medication before attack.
- She gave history of viral rhinitis about 15 days prior to presentation.

Clinical Exmamination

- Both tympanic membranes are normal.
- Tuning fork tests are normal.
- All cranial nerves, motor, sensory systems and reflexes are found to be normal.
- No cerebellar signs seen.
- Horizontal nystagmus of first degree beating to the left.
- Unterberger's stepping test: Abnormal deviation and rotation to the left.
- Gaze test, positional test and Dix-Hallpike test are normal.

Investigations

- Pure tone audiometry is within normal limit.
- Electronystagmography (ENG) done at the time of presentation showed spontaneous nystagmus to the left. Caloric test showed right sided hypoactive responses to warm and cold water irrigation.

Q.1: What is the most possible diagnosis?

Ans: This is a typical case of vestibular neuronitis. Patient presents with severe rotator vertigo along with nausea and vomiting lasting for a week. There are no ear symptoms like deafness, tinnitus, aural fullness, headache, diplopia or any sensory-motor loss. Classically it is preceded by an attack of upper respiratory tract infection,

yet in most cases (70%), this history may not be present. So absence of history of upper respiratory tract infection does not rule out vestibular neuritis.

Q.2: What is the treatment of above case?

Ans:

- The drug therapy for vestibular neuritis comprises vestibular sedatives and antiemetics, primarily to provide symptomatic relief. The patient may be started with antivertigo drugs.
- The main stay of therapy for long term relief is early mobilization and vestibular rehabilitation exercises.

CASE 2: BPPV

Case presentation: A 50-year-old male presented with repeated attacks of occasional rotator vertigo with severe nausea but no vomiting. Each attack lasting for about 1 minute for 2 weeks. Symptoms induced on turning usually in bed but sometimes even while sitting. Several times, the symptoms were elicited when the patients tried to get up from bed. He has no deafness, tinnitus, aural fullness and muscular weakness.

Examinations

- Otoscopic examination—normal.
- Tuning fork test—normal.
- No cranial nerve palsy.
- No motor/sensory deficit.
- Plantar flexor and deep tendon reflex normal.
- No spontaneous nystagmus.
- Dix-Hallpike test showed definite rotatory left beating nystagmus (anti-clockwise direction) in left lateral position of head. Nystagmus started after about 10 seconds and accompanied by severe vertigo and mild nausea. The nystagmus and vertigo subsided after about 30–40 seconds. Repeating the position reduced the vertigosignifigantly.
- Unterberger's stepping test, standing test and cerebellar tests were all normal.

Investigations: Pure tone audiometry—normal hearing.

Q1: What is the most possible diagnosis?

Ans: This is classical case of left side BPPV.

Q.2: What are the causes of episodic short lived rotatory vertigo lasting for seconds?

Ans:

- Benign paroxysmal positional vertigo (BPPV)
- Labyrinthine fistula
- Caloric effect
- Alternobaric vertigo
- Vertebrobasilar insufficiency
- Cervical vertigo

Q.3: What are the causes for episodic rotatory vertigo lasting less than 24 hours?

Ans:

- Meniere's diseasase
- Syphilitic labyrinthitis
- Delayed hydrops
- After middle ear surgery
- Compensation of previous vestibular lesions

Q.4: What are the causes for prolonged episodic rotatory vertigo lasting more than 24 hours?

Ans:

- Vestibular neuronitis
- Head injury
- Labyrinthectomy
- Vestibular neurectomy
- Labyrinthitis
- Metastatic lesions at CP angle
- Vascular lesions
- Ear surgery

CASE 3: MIGRAINE RELATED VERTIGO

Presenting Compaints

A 40-year-old male executive reported with recurrent attacks of vertigo each attack persisting for 2 to 4 hours with no accompanying symptoms. There was no precipitating factors that the patient could recall on asking leading questions about any ear symptoms like tinnitus, deafness or aural fullness, the patient categorically denied any related ear symptoms. The vertiginous attacks had been occurring once every 2–3 months for the last 2 years but for the last 3 months it is much more frequent occurring once or twice every week.

Important history noted

- Recurrent attacks of vertigo with no accompanying symptoms.
- No ear symptoms noted.
- Duration of each symptom is 2–4 hours.
- Patient state in between two attacks—nothing specified.

Past history

- Patient had undergone angioplasty 5 years back for cardiac problems.
- He has a mild persistent pain in shoulder 2 years back diagnosed cervical spondylosis for which he is using cervical collar.
- History of motion sickness in childhood.
- Family history of migraine.
- No other relevant past family history.

On examination

- Bilateral normal intact tympanic membrane.
- Rinne's test positive in both sides.
- Weber central.
- ABC normal.

CNS examination

- No motor/sensory loss.
- No cranial nerve palsies.
- No abnormal cerebellar signs.
- Plantar flexor, knee jerk normal.
- Corneal reflex—normal in both sides.

Balance system

- Stepping test—slight rotation and deviated to right side more or less within normal limits.
- Gait—normal.
- Romberg's test—normal.
- Head shaking test—normal.
- No spontaneous, gaze and positional nystagmus.

Investigations

- Cardiac examinations—normal.
- Routine blood test—normal.
- Pure tone audiometry—within normal limit.
- ENG, ECG, VEMP—normal.
- MRI Brain—Normal.

Q.1: What is the most possible diagnosis?

Ans: Migraine related vertigo (MRV) as there is family history of migraine and a past history of motion sickness. Both these factors and the episodic vertigo with no aural symptoms suggest possibility of MRV.

Q.2: What is the treatment of above case?

Ans: Since there is no definite clinical test to confirm it, a therapeutic trial with prophylactic anti-migraine drugs like flunarizine, amitryptyline and propranolol was instituted.

CASE 4: PERILYMPH FISTULA

Presenting Complaints

A 45-year-old male patient met with a road traffic accident where he injured his head. CT head was normal. There was a transient loss of consciousness. There was no history of any ear bleeding. The patient was kept for observation overnight. He was discharged on the next day. He felt a little unstable but could walk. After 2 days he started feeling unsteady while walking. There was mild rotator vertigo with no nausea or vomiting. The ear examination was essentially normal. Fistula sign was negative. Valsalva response was not recorded. He had tinnitus on the left side and high frequency SNHL. Tympanogram showed a shallow A-type curve. High resolution computed tomography (HRCT) was repeated which showed no fracture lines or any damage to the otic capsule. He was initially treated on symptomatic treatment hoping

that he will recover of his vestibular symptoms. However, his symptoms persisted. During this period he had to travel by air. Though it was a short flight, his symptoms worsened and he had strong vertigo. He sought medical help and had to return by road. The sudden aggravation of symptoms raised suspicion of perilymph fistula. He was taken up for left exploratory tympanotomy. There was thin fluid noted in the middle ear. It was sucked clear but reaccumulated within few minutes. On close observation it was detected to be coming through fracture at the foot plate of stapes. The ossicles otherwise were intact. The fracture was not very obvious because of mucosal folds which were hiding the crack and the leak. The mucosa was swollen. It was divided and raised to either side. A small piece of tragal perichondrium was placed and mucosa replaced. It was not perfect cover by mucosa but enough to hold the graft position. A piece of gel foam under the crura through obturator foramen provided additional support to keep the tissues pressed against the foot plate at least for a few days. He was kept on bedrest with head elevated by 30° for 5 days. He was a muslim by religion but was asked to avoid bending down during his prayers for a period of 3 weeks. His vestibular symptoms started improving the next day and became almost vertigo free in 2 weeks. He was not allowed to fly for 1 month. His hearing showed no improved for the following 3 months. His tinnitus slowely reduced but did not go completely.

Point to learn in this case

- Post-head injury instability/vertigo can have varied presentations and causes including post-concussion syndrome. Some of them have confusion symptomatology. Often the investigations may not clinch the diagnosis.
- The aggravation of symptoms subsequent to sustained pressure variations are strong suggestion towards the diagnosis of perilymph fistula. Probably while testing fistula sign the pressure variations are not sustained long enough.
- Proactive approach towards exploratory tympanotomy should be the right way to manage these patients. Endomeatal tympanotomy is such a safe procedure that one can afford to have some negative explorations which should be acceptable.
- Hearing improvement and response to tinnitus may be poor. However, some patients do improve significantly if intervened early.

Q.1: What are the distinguishing characteristics of peripheral and central vertigo?

Features	*Peripheral vertigo*	*Central vertigo*
Hearing loss and tinnitus	Common	Uncommon
Nausea and vomiting	Usually present and severe	Varies
Direction of nystagmus	One direction	Direction changing
Visual fixation	Inhibits	No change
Latency of the nystagmus	Present	Absent
Fatigable	Yes	No
Head thrust sign	Present	Absent
Recovery	Begins within days	Slow
Common causes	Benign paroxysmal positional vertigo, vestibular neuritis, Meniere's disease, labyrinthitis	Migraine, vertebrobasilar insufficiency, multiple sclerosis, cerebrovascular accidents, brain tumors and cerebellar disorders

CASE 5: ACUTE VERTIGO

Presenting Symptoms

A 35-year-old lady complaints of vertigo spells 4–8 times in the last three days. She felt like the room was spinning and it lasted for few seconds. She experienced vertigo mostly when she changed positions. The vertigo spells seemed to resolve on its own after several seconds.

Examination:

- No associated neurologic symptoms.
- Patient denied hearing loss, otalgia, otorrhea, aural fullness, tinnitus.
- She also denied noise exposure, ear trauma, prior ear surgery, or family history of hearing loss.

Q.1: What is the provisional clinical diagnosis?

Ans: This is a case of BPPV with acute attack.

Q.2: How the BPPV is diagnosed?

Ans: Dix-Hallpike test.

Q.3: What is the treatment of choice in BPPV?

Ans:

- In posterior semicircular canal BPPV, Epley's maneuver, Brandt-Daroff positional exercises and Semont maneuver are useful.
- Barbecue maneuver is useful treatment for horizontal canal BPPV.

Q.4: What are the surgical treatment done in BPPV?

Ans: Surgery is done for intractable cases not responding to particle repositioning procedures or vestibular rehabilitation. Surgical procedures for BPPV of the posterior semicircular canals are singular neurectomy and posterior semicircular canal occlusion.

Q.5: What are the investigations are done in vertigo patients?

Ans:

- Blood investigations—full blood count, blood urea, serum creatinine, fasting blood sugar, thyroid function test, VDRL and autoimmune screening.
- Audiogram—pure tone audiometry to rule out hearing loss.
- MRI scan is helpful in case of brain tumor, strokes or multiple sclerosis.
- ECG is done to rule out cardiac causes for dizziness such as myocardial infaraction.