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Diseases of Ear, Nose & Throat

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As per the Revised Competency-based M

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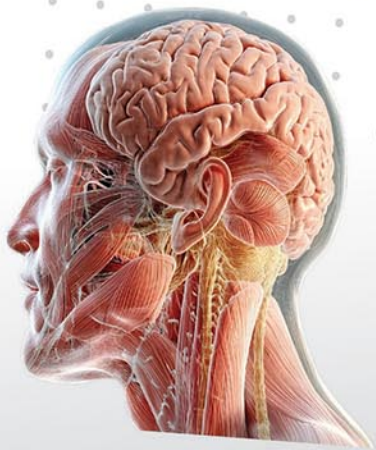

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Contents

11 CHAPTER Otologic Symptoms and Examination

Man begins to struggle and fight against nature. He makes many mistakes, he suffers. But eventually, he conquers nature and realizes his freedom. When he is free, nature becomes his slave.

—Swami Vivekananda

Subject Competencies

The student should be able to:

EN 2.3: Demonstrate the correct technique of examination of the ear including otoscopy.

EN 4.4: Demonstrate the correct technique to hold pneumatic otoscope (Siegel's speculum) and visualize and assess the mobility of the tympanic membrane and interpret and diagrammatically represent the findings.

PE 28.10: Perform otoscopic examination of the ear in children [vertical integration with pediatrics (PE)].

EN 3.1: Observe and describe the indications for and steps involved in the performance of otomicroscopic examination in a simulated environment (non-core).

EN 4.1: Elicit, document and present a correct history, demonstrate and describe the clinical features, choose the correct investigations and describe the principles of management of otalgia.

EN 4.6: Elicit, document and present a correct history, demonstrate and describe the clinical features, choose the correct investigations and describe the principles of management of discharging ear.

EN 4.21: Describe the clinical features, investigations and principles of management of tinnitus.

EAR SYMPTOMS

The common otologic symptoms are otorrhea, otalgia, hearing loss, vertigo and tinnitus **(Table 1)**. This chapter reviews the diagnoses to be considered when evaluating these symptoms. The pain and discharge indicate inflammatory disorders while auditory disorders present with hearing loss and tinnitus. Vertigo occurs in vestibular lesions. The symptoms of hearing loss, vertigo and facial palsy are discussed in their respective chapters.

TABLE 1 Ear symptoms.

Common	Otorrhea, otalgia, hearing loss, vertigo and tinnitus
Other	Itching, deformities, swelling, facial palsy, injury/foreign body (FB)
Associated	Fever, headache, vomiting, convulsions

OBJECTIVE

Demonstrate the correct technique of **examination of the ear** including otoscopy (EN 2.3)..

PHYSICAL EXAMINATION OF EAR

Examination consists of both physical [pinna and the surrounding area, external auditory canal (EAC), tympanic membrane (TM), middle ear, mastoid, Eustachian tube, facial nerve and other cranial nerves] and functional examination (hearing and vestibular). *See* **Table 2** for the general format of ear examination, which should be followed for each side of the ear. The table also shows the findings of clinical examination as well as their causes.

EXAMINATION OF PINNA AND MASTOID

The pinna needs inspection as well as palpation of its surfaces and the surrounding area including postauricular sulcus **(Figs. 1 and 2)**. The irregularities of the mastoid are "ironed out" in periosteal inflammation. Examine also for the following abnormalities:

- **Wildermuth ear:** Antihelix more prominent than helix.
- **Low-set ears:** Ears below the level of interpalpebral line in Treacher-Collins syndrome.

TABLE 2 Examination of ear: findings and their causes.

Physical examination	• **Pinna, preauricular and postauricular regions:** (*see* Chapter 33 "Diseases of the External Ear"). – **Size, shape and position:** Microtia or macrotia; cauliflower ear (thickened and deformed pinna due to perichondritis); bat ear (absence of antihelix), prominent Darwin tubercle – **Swellings:** Furuncle/hematoma/neoplasm; perichondritis, abscesses (mastoid or zygomatic abscess), lymph nodes – **Ulcer:** Malignancy, trauma, herpes zoster – **Scar:** Trauma/operation (endaural or postaural) – **Sinus and fistula:** Preauricular sinus, postauricular (mastoid) fistula – **Palpation:** Raised temperature and tenderness (perichondritis or abscess); thickness of tissues (perichondritis); fluctuation (hematoma, seroma or abscess). Painful movement of pinna (furunculosis of the external canal) • **Examination of external auditory canal** (*see* Chapter 33 "Diseases of the External Ear"): – **Size of meatus:** Atresia/narrow/wide – **Contents of lumen:** Wax, debris, discharge, fungus, polyp and foreign body (FB) – **Swelling:** Furuncle, sagging of posterosuperior area (coalescent mastoiditis), granulations, exostosis, neoplasm (benign or malignant) • **Examination of tympanic membrane (TM)** (*see* Chapters 33, 34, and 35 "Diseases of the External Ear"; "Acute Otitis Media and Otitis Media with Effusion"; and "Chronic Suppurative Otitis Media and Cholesteatoma") – **Color:** Red and congested (acute otitis media), bluish (secretory otitis media or hemotympanum), pale and amber (otitis media with effusion), Flamingo-pink blush (Schwartz sign) in active otosclerosis and a chalky plaque (tympanosclerosis) – **Cone of light:** Blurred or absent in retracted TM and middle ear effusion – **Quadrants of TM:** For describing the lesions of TM – **Retraction:** General retraction (tubal occlusion), retraction pockets in attic or posterosuperior region/collection of epithelial flakes, deeply retracted, fixed to promontory (adhesive otitis media) – **Bulging:** Acute otitis media, hemotympanum or neoplasm – **Thickness and transparency:** Opaque/thick; translucent/semitransparent/transparent/very thin – **Vesicles or bullae:** Herpes zoster or myringitis bullosa – **Perforation (acute or chronic suppurative otitis media):** Size (small, medium, subtotal or total in pars tensa), shape (oval, round or kidney), single or multiple (tuberculosis), site, central (safe chronic suppurative otitis media) or marginal (at the periphery involving the annulus) or attic (in pars flaccida) with cholesteatoma – **Mobility (siegelization):** Mobile (normal), restricted (presence of fluid), fixed (adhesions in the middle ear), or hypermobile (an atrophic segment of TM) • **Examination of middle ear (through the perforation, transparent TM, middle ear exploration)**: – **Mucosa:** Normal/atrophic/hypertrophic/polypoidal/granulations/in-growth/flakes of squamous epithelium (cholesteatoma) – **Contents:** Ossicles, growth, FB, discharge – **Normal structures:** Oval and round windows, Eustachian tube, coralization (normal coral-like bony growths of middle ear) • **Examination of mastoid** – **Swelling:** Abscess or enlarged nodes, furuncle (obliteration of retroauricular groove), fistula (burst abscess), scar (previous operation) – **Palpation:** Smooth (periosteal inflammation/subperiosteal abscess)/irregular/tenderness (mastoiditis) over antrum (just above and behind the meatus), tip, and between mastoid tip and antrum • **Examination of Eustachian tube (ET)** – Posterior rhinoscopy – Valsalva maneuver – Eustachian catheterization • **Examination of facial nerve** (*see* Chapter 38 "Facial Nerve and its Disorders") – Lower/upper motor neuron – **Grade:** Complete/partial
Functional examination	• **Auditory function** (*see* Chapter 12 "Hearing Evaluation") – Voice test – Tuning fork tests ◇ Rinne test ◇ Weber test ◇ Schwabach test ◇ Absolute bone conduction test – **Audiometry:** Pure tone, speech and impedance • **Vestibular function** (*see* Chapter 39 "Evaluation of Dizzy Patient") – Spontaneous nystagmus – Fistula test – Positional tests

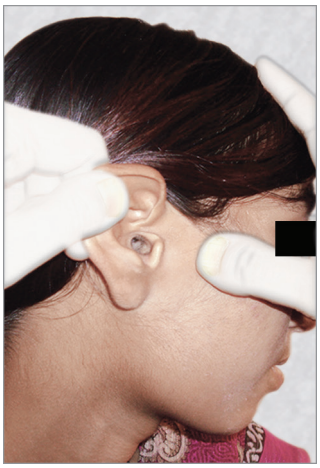
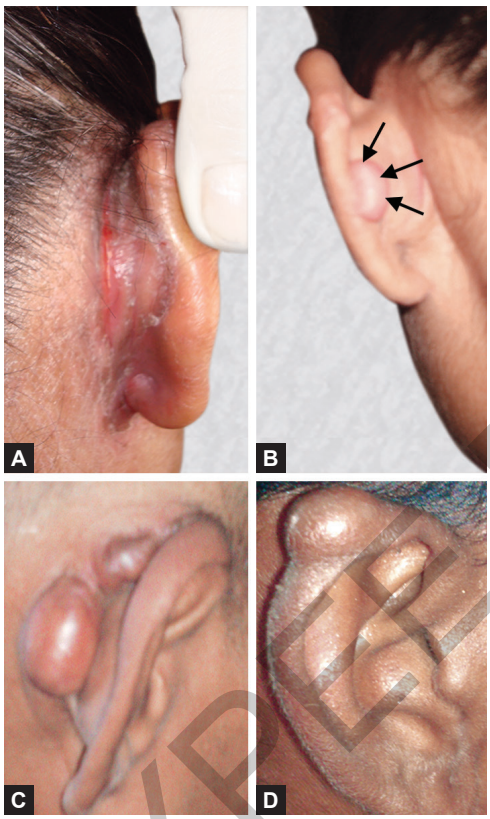


Fig. 1: Pulling the pinna upwards, backwards and laterally and tragus forwards spreads and straightens external auditory canal.



Figs. 2A to D: (A) Postauricular dermatitis; (B) Keloid. Medial surface of left pinna after ear piercing; (C) Right ear—keloid over postaural suture line; (D) Right ear—cyst over pinna.

- **Protrusion of pinna:** Forward and outward in furuncle of EAC; forward, outward and downward (erection of pinna) in mastoid abscess.
- **Obliterated postauricular sulcus:** Furuncle of posterior wall of EAC. It is maintained in mastoid abscess.

EXAMINATION OF EXTERNAL AUDITORY CANAL (EAC) AND TYMPANIC MEMBRANE (TM)

Retraction of pinna for examining external auditory canal (EAC): The EAC can be examined by pulling the pinna upward (in children, downward), backward and laterally while the tragus is pulled forward **(Fig. 1)**. This procedure not only spreads open the meatus but also straightens it and shows TM.

OBJECTIVE

Demonstrate the correct technique of holding ear speculum and otoscope and performing otoscopy and diagrammatically represent the findings of tympanic membrane (EN 4.4).

OTOSCOPY

For the OPD ear instruments, *see* Chapter 10 "History and Examination—General Set-up".

- **Aural speculum:** This is inserted into the cartilaginous portion of the EAC after retracting the pinna **(Fig. 3)**. It is used for examination and operations of the EAC, TM, and middle ear. The use of the largest ear speculum that can easily enter the canal is safe and provides a better view.

CAUTION

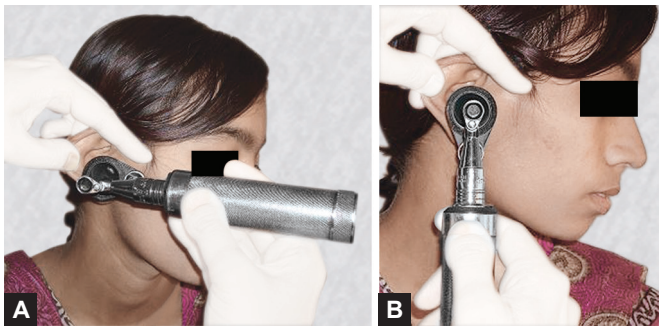
Ear speculum should not reach into the bony part of the EAC because that is painful and patient will not allow.

- **External auditory canal (EAC):** Look for the abnormalities of walls of EAC and its contents such as discharge, polyp or any other mass.

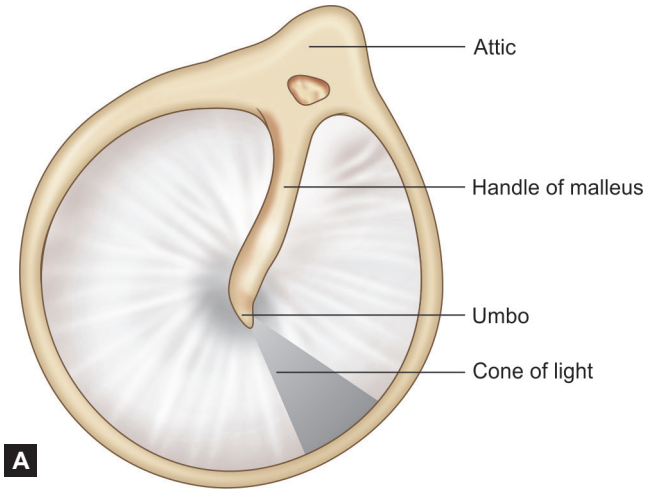
OTOSCOPE

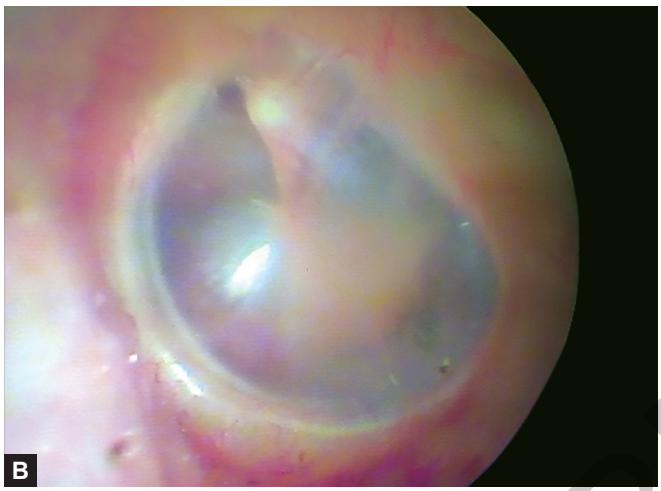
It has its own illumination and magnification and facilitates examination of EAC and TM. It is also useful in examining the ears and nose of infants and bedridden patients **(Figs. 4A and B)**.

Fig. 3: Ear speculum insertion. With left hand external auditory canal (EAC) is straightened and with right hand ear speculum is inserted in the cartilaginous part of EAC.



Figs. 4A and B: Otoscopy examination. Two ways (A and B) of holding and introducing the otoscope. Note the retraction of pinna by other hand.





Figs. 5A and B: (A) Tympanic membrane seen on otoscopy; (B) Left ear normal tympanic membrane as seen with endoscope.

For examination of the right ear, hold the otoscope in your right hand and hold and retract the pinna with your left hand. The otoscope is held, such as a pen, between the thumb, index and middle fingers. The little finger rests on the patient's face to stabilize the otoscope. So if the patient moves suddenly without any warning, the head of the patient and hands of the examiner will move in unison, thus avoiding any trauma to EAC.

The otoscope should be fully charged, as the low light may produce a yellow tint on the TM, leading to misinterpretation as middle ear effusion.

Tympanic membrane (TM): The normal TM **(Figs. 5A and B)** is obliquely set at the medial end of the meatus. It is semi-transparent and pearly white in color. It consists of two parts: (1) pars tensa, and (2) pars flaccida. The site, size and number **(Fig. 6)** of perforations, retraction, and granulations must be recorded. When TM is semitransparent or perforated, some structures (ossicles, windows, Eustachian tube, tumors) of the middle ear can be seen through it.

Uses of otoscope: Otoscope is useful not only in examining ears but also in examining the nose, especially in infants.

OBJECTIVE

Demonstrate the correct technique of holding Siegel speculum /pneumatic otoscope for visualizing and assessing the mobility of the tympanic membrane and interpreting its findings (EN 4.4).

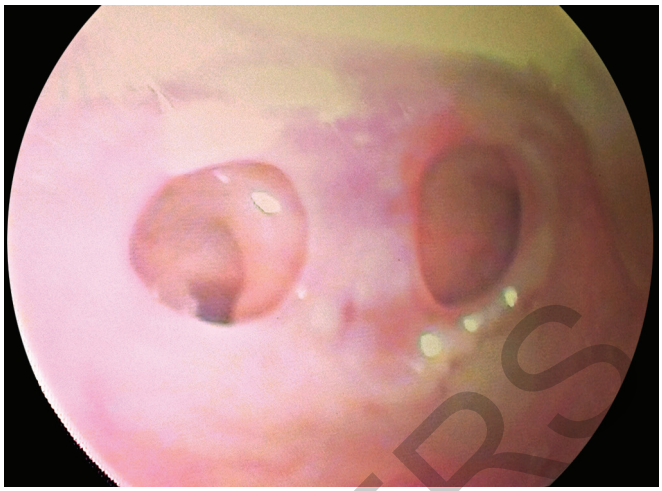
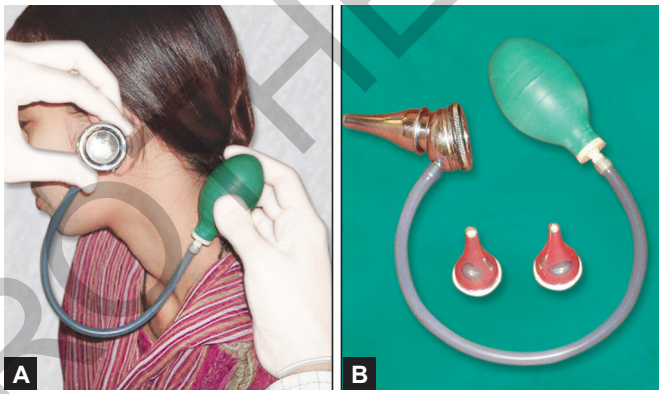


Fig. 6: Double central perforations in right ear as seen with endoscope.



Figs. 7A and B: Siegel's examination. Mobility of tympanic membrane is tested by alternately increasing and decreasing pressure in the external auditory canal. (A) Method of Siegel's examination; (B) Siegel's pneumatic speculum fitted with a convex lens and attached rubber bulb through plastic tubing.

SIEGELIZATION (PNEUMATIC OTOSCOPY)

Pneumatic otoscopy allows examination of the mobility of tympanic membrane (TM) in response to pressure changes. The normal TM moves in response to pressure changes. Pneumatic otoscopy has been reported to have a high sensitivity and specificity for diagnosing middle ear effusion. (*See* Chapter 34 "Acute Otitis Media and Otitis Media with Effusion"). Pneumatic otoscopy can diagnose OME when TM does not reveal any finding of middle ear pathology. It has been reported that pneumatic otoscopy is as good as or better than tympanometry and acoustic reflectometry. So, it can be used where tympanometry is not available. It is economical and easy to perform.

Siegel's pneumatic speculum (Figs. 7A and B): The Siegel's pneumatic speculum has an eye piece (convex lens) which has a magnification of 2.5 times. The eye piece covers the wider part (base) of aural speculum. A rubber bulb with the plastic tube is attached to insufflate air in the EAC. via the aural speculum. Magnification provides better appreciation of examination findings. The pressure in the EAC can be increased by pressing the bulb and decreased by releasing the bulb, thereby moving the TM.

USES (INDICATIONS)

- **Mobility of tympanic membrane:** It is tested with Siegel's speculum.
- **Fistula test:** It is for labyrinthine fistula (*see* Chapter 39 "Evaluation of Dizzy Patient").
- **Aural toilet:** Suction of middle ear secretions in cases of acute and chronic suppurative otitis media. By decreasing the EAC pressure, middle ear secretions can be sucked out in patients with CSOM.
- **Topical ear medicines:** Pushing of medicines through the central perforation of tympanic membrane. By increasing the EAC pressure, ear drops put in the ear, can be insufflated into the middle ear by using Siegel speculum.

SIEGELIZATION IN CHILDREN

Either the child lies down with head turned to one side or a child may sit on a parent's lap resting head on the parent's chest (*see* **Fig. 2,** Chapter 10). The parent's one arm holds both arms of the child and other arm of parent secures the head. The parent's legs are crossed over the child's legs. The older child or adult can sit and must remain very still. Insert the Siegle speculum of largest possible size which can be introduced in EAC comfortably.

METHOD

After retracting pinna to straighten the canal, examiner introduces the speculum in the EAC with his left hand. The bulb is held in right hand. Retracting the pinna and holding the speculum in one hand needs little practice. Inspect the EAC and TM. Gently squeeze the rubber bulb held in right hand to create positive pressure in EAC and notice the degree of TM mobility. Release the bulb to create negative pressure in EAC and again observe the degree of TM mobility.

CAUTION

Great care and small pressure changes are needed in patients with a very thin TM or segment to avoid discomfort or perforation. If the patient has perilymph fistula, vertigo, nausea, and vomiting may occur (fistula test positive).

Causes of immobility of TM: Otitis media with effusion (OME) (in a child with otalgia, hearing loss, or both), perforation of TM, tympanosclerosis, TM retraction, adhesive otitis media.

OBJECTIVE

Perform **otoscopic examination of the ear in children** (PE 28.10).

OTOSCOPIC EXAMINATION IN CHILDREN

METHOD OF EXAMINATION

1. Discuss with the parents the need for otoscopic examination, need for proper positioning for secure holding method, and if need be to remove wax to view tympanic membrane (TM).
2. **Equipment:** Select appropriate size of ear speculum. The largest possible size of ear speculum which can comfortably be introduced in the EAC.
3. **Positioning:** Ensure appropriate position based on age and/or developmental status of the child. Child's head should be effectively secured (*see* **Fig. 2,** Chapter 10). Use distraction techniques appropriate for age/development stage. It is helpful to "hug" child against "parent's chest".

   Do not forget to watch the shoulder and the Either the child lies down with head turned to one side or a child may sit on a parent's lap resting head on the parent's chest. The parent's one arm holds both arms of the child and other arm of parent secures the head. The parent's legs are crossed over the child's legs. The older child or adult can sit and must remain very still. Insert the Siegle speculum of largest possible size which can be easily introduced in EAC comfortably. head of the child. Infants and young children can be examined on table in supine/prone position as the infant's head and body can be steadied and secured easily against the table.
4. **Otoscopic examination:** Introduce the otoscope with dominant hand. Otoscope should be stabilized effectively by bracing finger/dorsum of hand on infant/child's face or head. Retract the pinna to facilitate view of TM. Non-dominant hand should be used for retracting the pinna posteriorly, laterally and downward (upward in grown up children and adults) and stabilizing the head.
5. Examine for all the clinical features of EAC, TM and middle ear as mentioned in the earlier sections **(Table 2)**.
6. **Precautions:** The tip of ear speculum should not touch the skin of bony part of EAC as it is very sensitive and leads to pain and abrasion.

OBJECTIVES

- Observe the steps involved in the performance of otomicroscopic examination during your clinical posting. (non-core EN 3.1).
- Describe the indications for the performance of otomicroscopic examination (non-core EN 3.1).
- Describe the steps involved in the performance of otomicroscopic examination in a simulated environment (non-core EN 3.1).

OTOMICROSCOPIC EXAMINATION

Operative microscope has a very bright light and magnifies the view of the external auditory canal and tympanic membrane and that helps the ENT surgeon with proper examination and diagnosis.

Indications:

1. Patients with diseases of EAC, tympanic membrane and middle ear.
2. Patients with the complaints of ear pain, ear discharge, ear polyp/mass, ear wax, bleeding, hearing loss, foreign bodies, tinnitus, and vertigo.

Materials: Otologic microscope and ear speculums, and if need be wax, discharge, and foreign body removal Forceps, Loops, Hooks and suction attachments.

Prior evaluation: Patient history, external ear exam and otoscopic examination should be performed prior to the otomicroscopy.

Procedure: The microscope is mounted on an arm that is attached to either a wall or heavy pillar stand. Ear Microscopic Examination may be done with the patient sitting up or reclining. Patient will need to lie still and breathe normally, with head tilted away from the ear to be examined. The microscope is maneuvered into position for focus and visualization of the external auditory canal (EAC) and tympanic membrane.

Precautions: Instruments' tip should not directly touch the skin of bony part of EAC as it is very sensitive and leads to pain and abrasion.

EXAMINATION OF EUSTACHIAN TUBE (ET)

- **Inspection:** The pharyngeal opening of Eustachian tube can be seen by posterior rhinoscopy mirror, nasal endoscope.
- **Patency:**
  - *Eustachian catheterization:* Eustachian catheter, which is mainly used to test patency of the Eustachian tube is, sometimes, also helpful in removing FBs from the nose. After anesthetizing the nasal cavity with 4% lignocaine, Eustachian catheter is passed into the nasopharynx along the floor of nose. Then it is turned medially (90°) and slightly withdrawn till the posterior free border of the nasal septum is felt. Now it is rotated 180° laterally to lie against the opening of Eustachian tube. A bulb is attached and then air is insufflated. An auscultation tube, which connects patient's ear to that of the examiner, is employed. Hearing of the sound of air entering the middle ear indicates the patency of Eustachian tube.
  - *Valsalva maneuver:* In the presence of a hole in TM, air can be heard escaping from the ear when patient tries to blow with mouth and nose closed.

FUNCTIONAL EXAMINATION OF EAR

Functional examination consists of auditory function (voice test, tuning fork tests, Rinne test, Weber test, Schwabach test, absolute bone conduction test and audiometry) and vestibular function (spontaneous nystagmus, fistula test, and positional tests). The most commonly used tuning fork is 512 Hz but forks of other frequencies such as 256 Hz, 1,024 Hz and 2,048 Hz are also desirable. All these functional tests are discussed in detail in Chapters 12 and 39 "Hearing Evaluation", and "Evaluation of Dizzy Patient". It is important to test facial nerve and know the grade of palsy (Chapter 38 "Facial Nerve and its Disorders").

OBJECTIVE

Elicit, document and present a correct history, demonstrate and describe the clinical features, choose the correct investigations and describe the principles of management of **otalgia** (EN 4.1).

OTALGIA (EARACHE)

Otalgia refers to pain in and around the ear. Ear pain is a very common otological complaint. For the treatment, it is essential to find its cause.

ETIOLOGY

- **Primary otalgia:** Pain in and around ear can be caused by inflammatory, traumatic, and neoplastic conditions of the ear (primary otalgia).
- **Secondary (Referred) otalgia:** The secondary otalgia is referred from the head and neck regions, which are innervated by the nerves that also supply to ear **(Box 1 and Fig. 8)**. (*See* also Chapter 1 "Anatomy and Physiology of Ear"):

Box 1: Causes of otalgia.

A. **Local causes (primary otalgia)**
- **Auricle:** Skin lesion, perichondritis or chondritis, trauma
- **External auditory canal:** Furuncle,* impacted wax,* otitis externa,* trauma,* foreign bodies, especially live insects,* otomycosis,* myringitis bullosa, herpes zoster oticus (Ramsay Hunt syndrome), and malignant neoplasms
- **Middle ear:** Acute otitis media,* Eustachian tube obstruction,* cholesteatoma,* mastoiditis,* Barotrauma, and malignancy of middle ear
- **Intracranial complications of otitis media:** Extradural abscess

B. **Referred causes (secondary otalgia)**

1. **Area supplied by CN V (trigeminal nerve)**
   - **Dental and periodontal diseases:*** Caries tooth, apical abscess, impacted 3rd molar, malocclusion. erupting dentition in children.
   - **Oral cavity:** Infection, trauma, aphthous* or malignant ulcers of oral cavity*
   - **Salivary glands:** Parotid and submandibular inflammatory and malignant diseases
   - Periauricular lymphadenopathy from scalp or neck infections
   - **Temporomandibular joint:*** Myofascial pain/dysfunction, bruxism, osteoarthritis, recurrent dislocation, ill-fitting denture, malocclusion, Costen's syndrome
   - **Nose and paranasal sinuses:** Trauma, infection, tumors and contact points between turbinates and septal spur
   - **Nasopharynx:** Infection and tumors and after adenoidectomy*
   - Sphenopalatine (Sluder's) neuralgia
   - Trigeminal neuralgia
   - **Headache:** Tension type, traction and inflammatory headaches
   - **Atypical facial pain**
2. **Area supplied by CN IX (glossopharyngeal nerve)**
   - **Oropharynx:*** Acute tonsillitis, peritonsillar abscess, post-tonsillectomy, benign and malignant ulcers of soft palate, tonsil and its pillars and base of tongue and tuberculosis
   - Elongated styloid process (Eagle's syndrome)
   - Glossopharyngeal neuralgia
3. **Area supplied by CN X (vagus nerve)**
   - **Vallecula, larynx, laryngopharynx, esophagus:** Malignancy* or ulcerative lesions
   - **Thyroid:** Thyroiditis
   - **Cardiac/pulmonary:** Coronary artery disease (CAD), aneurysmal dilation of great vessels
   - **Esophagus:** Hiatus hernia with gastroesophageal reflux
4. **Area supplied by C2 and C3 spinal nerves**
   - Cervical arthritis/disc disease
   - Cervical spondylosis,* injuries of cervical spine, caries spine
5. **Facial nerve:** Geniculate neuralgia, Bell's palsy,* and herpes zoster oticus
6. **Psychogenic**

*Common causes of otalgia.

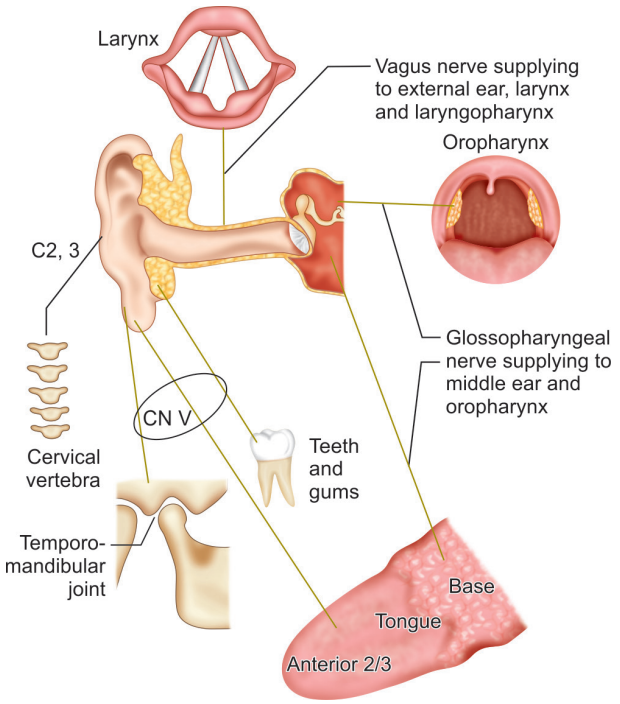


Fig. 8: Referred otalgia. Common causes of referred otalgia and nerve supply of ear.

Critical Thinking Case and Questions

Case Study 1

In the monsoon season, a 40-year-old lady came to ENT OPD with the history of severe right ear pain and block (fullness/Hearing loss) feeling in right ear for 5 days. She is feeling some discharge in the right ear. She put some oil drops in the ear but that did not help rather she feels pain has increased after that and last night she could not sleep properly due to pain. On further inquiry, she admitted that 1 week ago she tried to clean her ear herself with hair pin. There is no history of cough and cold and fever. In the past, she has never suffered from such problem. She is not diabetic. On otoscopic examination, white plug dotted with black debris could be seen. There was no swelling of external ear canal and no ear discharge. Tympanic membrane was not visible. Rest of the local and general survey examination was normal. Rinne test was negative and Weber was lateralizing to right ear. *See* Chapter 33 "Diseases of the External Ear".

Questions:

1. What is the most probable diagnosis?
2. What are the common predisposing factors of this disorder?
3. What type of hearing loss is indicated by the hearing test?
4. What further investigations would you like to have in this case?
5. How will you treat this patient?

Answers are given at the end of chapter.

HISTORY AND PHYSICAL EXAMINATION (BOX 2)

History and physical examination will usually reveal the source of ear pain and indicate whether the otalgia is local or referred in origin **(Flowchart 1 and Box 2)**. Note the mode of onset, distribution of pain (localized, diffuse, radiating, deep-seated) character, severity, periodicity, and factors aggravating and relieving pain.

Box 2: Otalgia: history, physical examination and investigations.

- **History**
  - **Onset and duration:** Sudden, gradual, preceding events
  - **Quality:**
    - ◇ **Sharp, throbbing and lancinating pain:** Acute otitis media (AOM)
    - ◇ **Continuous dull throbbing pain:** Furuncle of external auditory canal (EAC)
  - **Localization:**
    - ◇ **Pain at tragus:** Furuncle in anterior wall of EAC
    - ◇ **Deep-seated ear pain:** AOM
    - ◇ **Pain behind the ear:** Mastoiditis and infected post-auricular nodes
    - ◇ **Pain below the ear:** Eustachian tube infection (salpingitis) and parotid infections and malignancy.
    - ◇ **Painful chewing:** Furuncle EAC and Costen's syndrome of temporomandibular joint.
    - Vague and nonlocalizing
    - ◇ **Associated ear symptoms:** otorrhea, hearing loss and ear fullness, swelling, trauma and foreign body
    - ◇ Whether ear pain is associated with: mastication, swallowing, voice change, purulent rhinorrhea or physical exertion
    - ◇ **Past history:** Ear surgery
- **Physical examination**
  - Ear, nose, throat, head and neck examination
  - Dental examination
  - **Craniomandibular**: Palpation of temporomandibular joint (TMJ) and surrounding musculature
  - Cervical spines
  - **Neurologic examination**: Cranial nerves
- **Investigations**
- Flexible fiberoptic examination of nose, pharynx and larynx (nasopharyngolaryngoscopy)
- Esophagogram
- X-ray cervical spines
- Orthopantomogram
- X-rays for TMJ and styloid process

CAUTION

If the ear pain appears to be disproportional to otological findings, especially, in elderly patients, preclude the possibility of referred otalgia especially upper aerodigestive tract malignancy.

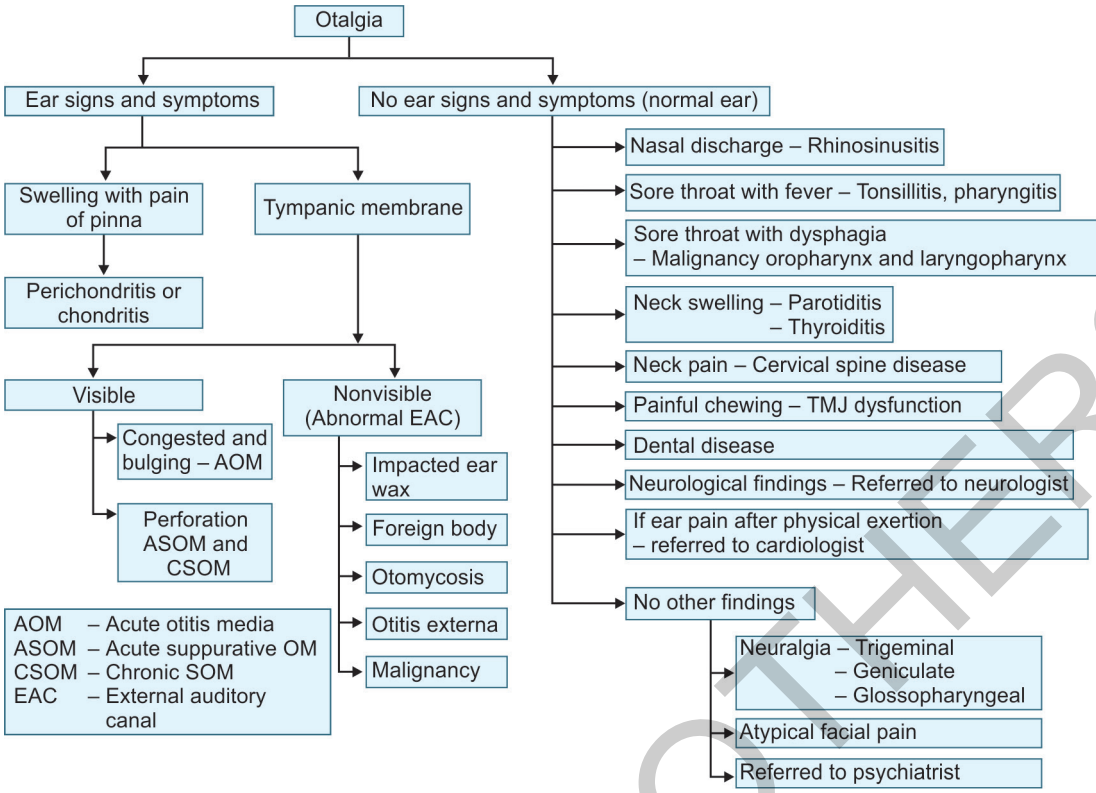
MANAGEMENT

- Further investigations are advised to confirm the clinical diagnosis.
- In case of suspected malignancy of oral cavity, pharynx, larynx, nose and paranasal sinuses, biopsy will confirm the diagnosis.
- Once the cause of ear pain is known, treatment is instituted accordingly.

OBJECTIVE

Elicit, document and present a correct history, demonstrate and describe the clinical features, choose the correct investigations and (EN 4.6) describe the principles of **management of discharging ear**.

Flowchart 1: Clinical diagnoses in patients with otalgia.



Box 3: Causes of otorrhea.

- **External auditory canal:** Otitis externa (OE),* otomycosis,* furunculosis,* keratosis obturans, malignant or necrotizing otitis externa, acute dermatitis (such as seborrheic, eczematous), parotid abscess, canal cholesteatoma, neoplasms (ceruminoma and malignancy)
- **Conditions predisposing to secondary otitis externa:** Osteoma, exostoses, canal dehiscence into the mastoid or glenoid fossa, otitis media with perforation, allergy to ear drops
- **Tympanic membrane:** Granulation tissue,* granular myringitis,* bullous myringitis, retraction pocket, cholesteatoma
- **Middle ear and mastoid:** Acute and chronic suppurative otitis media (ASOM and CSOM)* and mastoiditis, cholesteatoma,* granulomatous disease, neoplasms
- **Cerebrospinal fluid (CSF) otorrhea:** Fracture temporal bone, Tegmen defect, cochlea deformity, Hyrtl's disease

*Common causes of otorrhea.

Critical Thinking Case and Questions

Case Study 2

A 20-year-old girl has left ear discharge for 5 years. The discharge is thick, yellowish and putrid. She says discharge is continuous and never stops for more than couple of days or a week. She has used many ear drops but in vain. There is no history of ear pain, hearing loss, and vertigo or any other nose and throat problem. Patient does not have any headache, fever, or any swelling in the vicinity of left ear. After the ear toilet, otoscopy examination was conducted. The posterosuperior deep retraction pocket with granulations and whitish flakes could be seen. Rest of the ear, nose and throat examination did not reveal any abnormality. Rinne test was negative and Weber was lateralizing to left ear. The absolute bone conduction (ABC) test was normal. There was no nystagmus and fistula test was negative. *See* Chapter 35 "Chronic Suppurative Otitis Media and Cholesteatoma".

Questions:

1. What is your provisional diagnosis?
2. What type of hearing loss is indicated by the hearing test?
3. What further investigations would you like to have in this case?
4. How will you treat this patient?
5. Can this disease if not treated give some life-threatening complications?

Answers are given at the end of chapter.

OTORRHEA

Otorrhea[1], which refers to discharge from the ear, is a very common otologic complaint.

ETIOLOGY

Infective diseases are the most common causes of otorrhea **(Box 3)**.

ASSESSMENT

History

Note whether the discharge is unilateral (note the side) or bilateral (note the worst ear), acute or chronic (note the duration) and associated ear, nose and throat symptoms. Otorrhea may be profuse or scanty and continuous or intermittent. Otorrhea from ASOM may be bloody, mixed with mucus, or mucopurulent and typically short-lived.

Clinical Features of Discharge and their Causes

- **Amount:**
  - *Profuse:* Discharge flows out of ear canal, e.g., safe CSOM and coalescent mastoiditis

[1]Oto, ear + G. rhoia, flow.

- *Moderate:* Discharge seen only in external ear canal but does not flow out, e.g., safe CSOM and otitis externa
- *Scanty:* On cleaning discharge simply stains the swab stick, e.g., primary cholesteatoma

- **Smell:**
  - *Putrid (foul smelling):* Unsafe CSOM cholesteatoma; coalescent mastoiditis
  - *No foul smell:* Safe CSOM
- **Color:**
  - *Creamy yellow:* Purulent discharge in suppurative otitis media (ASOM, CSOM)
  - *Greenish: Pseudomonas* infection
  - *Blood-tinged (sanguineous):* ASOM, granulations, unsafe CSOM, malignancy and trauma
  - *Watery:* Watery otorrhea, which may be copious, subtle or intermittent, suggests a CSF leak
- **Nature of discharge:**
  - *Mucopurulent/Purulent:* ASOM and CSOM
  - *Serous:* Eczematous otitis externa
  - *String forming (Mucoid):* Discharge from middle ear mucosa (Goblet glands) infections, such as safe CSOM
  - *Nonstring forming:* Discharge from external ear skin infection, e.g., otitis externa
  - *Glue:* Grommet insertion in children with otitis media with effusion
  - *Continuous:* Unsafe CSOM
  - *Intermittent:* Safe CSOM; eczema or psoriasis of ear canal skin

Stages of CSOM
- **Active:** Discharging ear
- **Quiescent:** No ear discharge for few days in chronic otorrhea
- **Inactive:** Dry ear for more than 3–6 weeks
- **Healed:** Healed perforation of TM

- **Associated symptoms and their causes**
  - *Pain:* Acute otitis externa (OE)
  - *Pruritus:* Chronic OE and otomycosis

Most common causes of ear discharge:
- **Children:** Acute suppurative otitis media (ASOM) and chronic suppurative otitis media (CSOM)
- **Adults:** CSOM and otitis externa.

- **Past history**
  - *Ear surgery:* Recurrence of middle ear disease or infection in mastoid cavity
  - *Neurotologic surgery:* Immediate or delayed CSF otorrhea
  - *Grommets:* Otorrhea is common after myringotomy tube insertion.

Most common causes of purulent or mucoid ear discharge: Acute and chronic suppurative otitis media (ASOM and CSOM) and cholesteatoma.

Examination

Evaluation requires meticulous suctioning of secretions under microscope to find the source of discharge.

- **Otitis externa:** It may not allow a thorough ear microscopic examination because of edema, debris and tenderness.
- **Foreign body:** An unsuspected foreign body may be found.
- **Stenosis:** Refractory OE may result in EAC stenosis.
- **Tympanic membrane:** Perforation, granulation and tympanostomy tube, retraction, tympanic sclerosis and cholesteatoma.
- **Postoperative mastoid cavity:** In cases of modified or radical mastoidectomy, infection must be differentiated from recurrent or residual cholesteatoma.

- **Audiometry:** If the EAC is obstructed and tuning fork tests reveal conductive hearing loss, audiometry is deferred.
- **Tympanometry:** It is not done in suspected case of CSF otorrhea as it can result in pneumocephalus. It may be painful in cases of otitis externa.

Investigations

- **Culture and sensitivity:**
  - *Cautions:*
    - Topical antibiotic should be stopped before taking the sample for culture and sensitivity as they will affect the culture growth.
    - In refractory cases of otorrhea and persistent myringotomy tube, sample should be taken from deeper part of EAC or from the site of perforation.
  - *Microorganisms:*
    - *Most common microorganisms causing OE* are *Pseudomonas aeruginosa* (in malignant or necrotizing OE) and *Staphylococcus aureus*.
    - *Actinomyces israelii*: It is an anaerobic gram-positive bacterium that can cause OE from primary dental or parotid infection. This refractory OE presents with granulation tissue in EAC and thick yellow ear discharge and needs surgical debridement and prolonged antibiotic therapy.
- **Computed tomography (CT) imaging:** Preoperative CT imaging is important in cases of EAC stenosis (congenital, traumatic or neoplasms) with cholesteatoma.
- **Biopsy:** It is required to know the nature of neoplasms.
  - *Contraindication:* In cases of glomus tumors, it should be avoided as it can result in profuse bleeding.
- **Immunodeficiency and allergy:** Identifying underlying immunodeficiency or allergy should be considered in refractory cases.

Treatment

The treatment begins once the cause of the otorrhea is determined. Antibiotic, topical steroid, and repeated ear toilet may be required. Aminoglycosides ear drops are not used as they are ototoxic. Ear drops are not prescribed in case of CSF otorrhea as they can enter into cranium.

- **Topical isopropyl alcohol:** In normal ears, it can dry the scanty serous otorrhea.
- **Pre-existing perforation and grommet:** Water should not go into the ear. A short course of topical antibiotic usually controls the otorrhea. Tube removal and repeated debridement is needed for adequate drainage.
- **Granular myringitis:** It usually responds to topical steroid or 5-fluorouracil. Some cases may need debridement of the granulations.
- **De-epithelialization of tympanic membrane:** It does not respond to drying agent (Burrow's solution), it may need spilt-thickness skin graft.

- **Acute otitis media:** Systemic antibiotic is indicated. Topical antibiotic will prevent secondary OE. In refractory cases, antibiotic is changed as per the report of culture and sensitivity. A pinpoint perforation is enlarged to establish adequate drainage.
- **Cholesteatoma and neoplasms:** Surgery is indicated in these cases.
- **Open mastoid cavity otorrhea:** It needs debridement and treatment with topical antifungal or antimicrobial eardrops or acidifying and drying agents such as boric acid and alcohol solution. Granulation tissue and mucosalized epithelium in the mastoid bowl requires chemical cauterization.

EAR POLYP

An ear polyp is a pedunculated mass, which lies in the EAC. Polyps like structures may arise from EAC **(Fig. 9)** or middle ear. Granulomatous and neoplastic lesions may present as ear polyp. It is usually associated with otorrhea and hearing loss. Other associated symptoms include bleeding, pain and itching.

ETIOLOGY

- **External auditory canal disorders:** Furuncle, trauma, foreign bodies and keratosis obturans may trigger formation of granuloma **(Box 4)**. The tumors of EAC are rare.
- **Chronic suppurative otitis media, especially cholesteatoma:** Middle ear mucosa gets prolapsed and presents as pedunculated granuloma.
- **Glomus tumors:** They are rare and present with red fleshy polyp that bleeds easily.
- **Malignancy of middle ear:** It is rare.

HISTORY AND EXAMINATION

- **Associated symptoms:** Ear polyp is usually associated with otorrhea and hearing loss. Other associated symptoms include bleeding, pain and itching.
- **Consistency:** Inflammatory polyps are soft whereas tumors are firm, friable and bleed readily.
- **Probing:** It is useful in determining the site of origin of the polyp. A probe can be passed all around if it is arising from the middle ear but it cannot if polyp is arising from the EAC. Glomus and malignant tumors bleed readily on probing.
- **Tuning fork tests:** They will reveal the type of hearing loss.

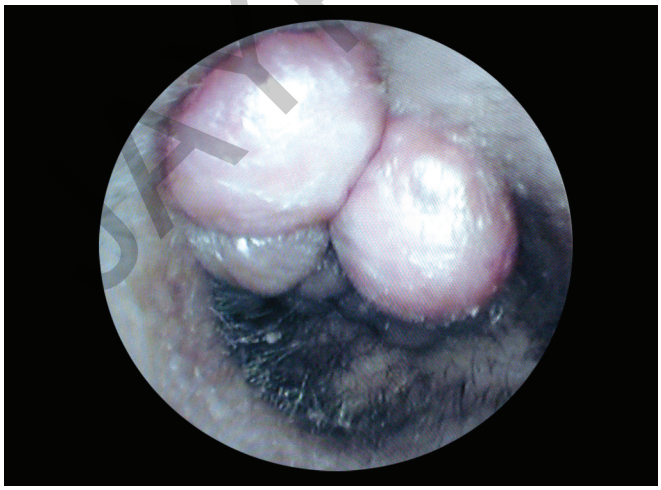


Fig. 9: Multiple polyps like structures arising from external auditory canal.

Box 4: Causes of polyp.

- **External auditory canal:** Unhealed furuncle, trauma, keratosis obturans, foreign body, tumors (ceruminoma, exostosis, malignancy)
- **Middle ear:** CSOM (tubotympanic and cholesteatoma), glomus tumors (tympanicum and jugulare), carcinoma

INVESTIGATIONS

- **Culture:** Discharging material is submitted for culture and cytological examination.
- **Audiometry:** It is done if tuning fork shows sensorineural hearing loss.
- **CT scan:** It is advised in cases of glomus and malignant tumors and complications of suppurative OM.
- **Biopsy:** It will reveal the nature and cause of polyp.

TREATMENT

The predisposing and causative disorders should be treated.

- **Antibiotics:** Inflammatory polyps usually respond well to antibiotics.
- **Surgery:** Polyp may need removal and histopathology study.
  - Polypectomy facilitates better visualization and drainage of middle ear.

CAUTION

Middle ear polyps should not be avulsed as it can damage middle ear structures such as ossicles and facial nerve.

OBJECTIVE

Describe the clinical features, investigations and principles of **management of tinnitus** (EN 4.21).

TINNITUS

Tinnitus[2] stands for the perception of sound (ringing or noise), which has no external stimulus. Approximately, one-third people experience tinnitus sometime in their lives. The etiology of this common ear symptom is poorly understood. The severity of sound ranges from nearly undetectable to severe and debilitating. Though there is no cure for chronic tinnitus, there are various modalities of management, which significantly improve the quality of patients' life.

Auditory hallucination: It is a psychiatric disorder in which patient hears voices or other organized sounds, such as music or conversation.

CLASSIFICATION

Tinnitus can be categorized into different groups **(Box 5)**.

1. **Subjective and objective:** Subjective tinnitus, which is the most common, is perceived only by the patient. Objective tinnitus can be perceived by the examiner also.

[2] *Tinnire* (Latin word) means "ringing/jingling; *Tinnio* (French) means to jingle, clink".

Box 5: Classification and causes of tinnitus.

1. **Nonpulsatile [Continuous and subjective tinnitus is most common (99%)]**
   a. **With hearing loss (90%)**
      i. **External ear:** Wax, hair, foreign bodies, live insects
      ii. **Middle ear:** Otitis media, patulous Eustachian tube, hemotympanum (head injury), barotrauma
      iii. **Labyrinth:** Meniere's disease, noise exposure, ototoxic agents, presbyacusis, and other causes of sensory hearing loss
      iv. **CN VIII:** Acoustic neuroma and other causes of neural hearing loss
   b. **Without hearing loss (10%)**
      i. **Psychogenic:** Stress, anxiety, depression, heightened emotions
      ii. **Hypotension**
      iii. **Hypoglycemia**
      iv. **Epilepsy**
      v. **Miscellaneous:** Migraine, diabetes mellitus, thyroid dysfunctions, hyperlipidemia, vitamin deficiencies (A, B, zinc)
      vi. **Audible spontaneous otoacoustic emissions**
      vii. **Idiopathic**
2. **Pulsatile (noncontinuous)—subjective (99%) or objective (rare—1% only)**
   a. **Vascular**
      i. **Arterial**
         - **Atherosclerosis:** Atherosclerotic carotid artery disease (ACAD) and atherosclerosis of external carotid or subclavian
         - **Glomus tumors:** Glomus tympanicum, glomus jugulare
         - **Vascular malformations:** Congenital arteriovenous malformations (AVM), acquired arteriovenous fistulae (AVF)
         - **Arterial dissection:** Carotid, vertebral
         - **High cardiac output:** Pregnancy, anemia, exercise, thyrotoxicosis
         - Otosclerosis
         - Hypertension
      ii. **Venous**
         - Benign intracranial hypertension (BIH) syndrome (pseudotumor cerebri)
         - Venous hum
         - Jugular bulb anomalies
   b. **Nonvascular**
      i. Myoclonus (multiple sclerosis, brainstem infarct)
         - Palatal
         - Tensor tympani
         - Stapedius
      ii. Vascular neoplasm
         - Skull base
         - Temporal bone
      iii. Temporomandibular joint disease
   c. **Idiopathic**

Causes of objective tinnitus:
- Patulous Eustachian tube
- Stenosis or aneurysm of carotid artery or its branches
- Palatal myoclonus
- Glomus jugulare tumor
- Venous hum
- Arteriovenous malformations

2. Pulsatile and nonpulsatile
3. Continuous and noncontinuous
4. Vascular and nonvascular
5. Tinnitus aureum and tinnitus capitum
6. Unilateral and bilateral
7. Mild, moderate and severe
8. Acute and chronic
9. With hearing loss (90%) and without hearing loss (10%)
10. Central and peripheral.

Somatosounds: They are objective tinnitus sounds generated by patient's body, such as myoclonus and pulsatile blood flow variations in vessels near the ear.

Salicylates-induced tinnitus and sensorineural hearing loss (SNHL): Salicylates in higher doses can cause reversible changes in outer hair cells function and 20–40 dB SNHL. Patient can have flat bilateral SNHL and tinnitus which are reversible within 24–72 hours of discontinuation of salicylates.

Myoclonus

Contraction of certain muscles can cause clicking type tinnitus. Botulinum toxin injection provides temporary relief by paralyzing the causative muscle.

- **Palatal myoclonus:** There occurs regular and rhythmic contractions of muscles of the soft palate (tensor and levator veli palatine) and pharynx (salpingopharyngeus and superior constrictor).
- **Stapedial myoclonus:** Regular and rhythmic contractions of stapedius muscle (with/without tensor tympani) causes tinnitus.

- **Noise exposure and tinnitus:** Brief exposure to loud noise can cause transient SNHL and tinnitus which disappear within hours or days of the exposure. Repetitive and continuous exposure to loud sounds can result in permanent damage to cochlea.
- **Tinnitus in acoustic neuromas:** Over 80% patients with acoustic neuroma develop tinnitus while 10% patients present initially only with tinnitus.

OBJECTIVE

Describe the clinical features of tinnitus (EN 4.21).

History and Physical Examination

History better defines the patient's tinnitus **(Box 6)**. Patient should describe the nature of the sound (ringing, rushing, white noise, pure tone, machinery).

- In cases of intermittent tinnitus, factors aggravating and relieving the tinnitus should be noted.

Eighty-five percent of tinnitus patients have hearing loss.

- **Associated symptoms:** Progressive hearing loss with imbalance: acoustic neuroma
- **Past history:** Otorrhea, acoustic trauma, ear surgery, trauma, and ototoxic drugs
- **Otoscopy:** In cases of pulsatile tinnitus, otoscopy may reveal a middle ear mass. Look for otitis externa and otitis media with effusion, fistulae in EAC, vascular lesion, perforation of TM, tympanosclerosis and cholesteatoma.
- **Auscultation:** Note any bruit in the temporal, mastoid and neck regions.

Box 6: History and physical examination.

A. **History**
- **Site and side:** Ear or head, unilateral or bilateral
- Mode of onset, duration, progression, frequency, continuous or intermittent and associated events
- **Quality (loudness and pitch):** Popping, clicking or cricket, swishing, pulsating or throbbing, ringing, buzzing, hissing, rustling, or roaring
- **Severity:** The impact of tinnitus on patient's life.
  - Factors aggravating and relieving
  - Other otologic symptoms such as hearing loss, vertigo, otalgia and otorrhea
  - H/o noise exposure, ototoxic agents, head injury, CNS infections
  - Medical, psychological, and social histories and conditions
  - Past history of otologic surgery
  - Family history of otologic disease

B. **Physical examination**
- ENT head and neck examination
- Neurotologic examination, including otoscopy, hearing tests, cranial nerve tests
- In cases of pulsatile tinnitus
  - Auscultation: Assess for bruits in and around ear, orbits and neck
  - Compare the rate of objective pulsatile tinnitus with patient's pulse
  - Effects of light pressure over internal jugular vein and turning the head on either side
  - Observe the concurrent contractions of soft palate or tympanic membrane
  - Flexible nasopharyngoscopy in cases of palatal myoclonus
- Medical review of systems
- Systemic examination
- Neurologic consultation in cases of myoclonus and pseudotumor cerebri

C. **Audiologic evaluation**
- Tuning fork tests
- Pure tone audiometry
- Speech perception in quiet and noise
- Tympanometry

D. **Tinnitus evaluation**
- Matching tinnitus to sounds
- Determine minimum masking levels
- Measure residual inhibition

E. **Radiological imaging**

- **Audiogram:** Pure tone audiometry may reveal otosclerosis, Meniere's disease, or noise-induced hearing loss. Tinnitus matching should also be performed. Tympanometry and stapedial reflexes reveal the middle ear disorders.
  - *Cerebellopontine angle tumors:* The cerebellopontine angle (CPA) lesions should be suspected in cases of unilateral or significant asymmetrical sensorineural hearing loss (SNHL). Ten percent of acoustic neuroma patients present with tinnitus. This rate increases to 83% with passage of time.
- **Abnormally patent Eustachian tube:** Tinnitus synchronous with respiration may occur in cases of abnormally patent Eustachian tube.

OBJECTIVE

Describe the investigations required in patients with tinnitus (EN 4.21).

Investigations
- Blood tests for anemia, diabetes, dyslipidemia, syphilis, thyroid dysfunctions
- Catecholamine level in serum and urine for glomus tumors
- Imaging.

Most common causes of pulsatile vascular tinnitus: Benign intracranial hypertension (BIH) syndrome, atherosclerotic carotid artery disease (ACAD), glomus tumors and dural vascular malformations such as congenital arteriovenous malformations and acquired arteriovenous fistulae (AVF).

Imaging studies in bilateral nonpulsatile subjective tinnitus with symmetrical SNHL: Most patients do not need any imaging studies.

- Tinnitus is a symptom not a disease. It can be so disabling that the patient can have suicidal tendencies.
- Subjective tinnitus is most common and is heard only by the patient.
- Objective tinnitus can be heard by both patient and examiner.

OBJECTIVE

Describe the principles of treatment of patients with tinnitus (EN 4.21).

Tinnitus Management Program

Main elements of treatment of subjective tinnitus: Masking, counseling and psychotherapy. In many cases of chronic tinnitus, there is no "cure"; however, there is a wide array of strategies, which helps patients in getting control over their tinnitus.

Pharmacotherapy

Medicines, such as tricyclic antidepressants, SSRI, IV lidocaine, antiepileptics, lipoflavinoids, vasodilator, sedatives, vitamins, tranquilizers, zinc therapy, carbamazepine and clonazepam have been used in the treatment of tinnitus with variable results.

Acoustic Therapies

Acoustic therapies **(Box 7)** constitute a vital component of an effective tinnitus management program. This noninvasive therapy provides not only immediate relief but there also occurs tinnitus suppression or temporary disappearance of tinnitus (residual inhibition).

- **In-the-ear devices:** For many patients, direct sounds to their ears are more effective than environmental sounds. In-the-ear devices, though comparatively expensive, are most portable, inconspicuous and efficient in obtaining relief from the tinnitus.
- **Hearing aids:** They are beneficial for the patients who have significant hearing loss. Better hearing may relieve some patients of the frustration, isolation and depression.
- **Combination instruments:** They are indicated in the patients who are already using the hearing aid and feel that sound generators will provide additional tinnitus relief.

Box 7: Examples of acoustic therapies.

- **Pleasant environmental sounds:**
  - Music, ocean waves, rain forest, summer night, television, or relaxation CDs
  - Tabletop sound machines
  - Cassette tapes and CDs
  - Tabletop water fountains
  - Fans and air purifiers
- **Sounds close to the ears**
  - Sound pillow and pillow speakers
  - Headphones and earphones
- **Sounds directly into the ear canal**
  - In-the-ear sound generators or maskers
  - Hearing aids
  - Combination instruments (combination of hearing aid and sound generator)

Tinnitus Matching

It is not related with the severity of tinnitus but rather targets at masking patient's tinnitus. It is done with pure tone audiometry and consists of–

- Pitch matching
- Loudness matching
- Minimal suppression level masking to effectively mask the tinnitus.

Lifestyle Changes (Box 8)

Many patients observe that their tinnitus worsens when they are tired. They should get enough restful sleep.

Though exercise may increase tinnitus problem in patients, it should be done regularly as it helps in stress reduction and improves cardiovascular health, muscle tone, mood and sleep patterns.

- Earplugs and earmuffs protect against harmful sounds and noises, which increase not only loudness of tinnitus but also produce noise-induced hearing loss.
- Tinnitus is less bothersome when patients are busy in their work. Retired persons should be encouraged to keep themselves busy in enjoyable and rewarding activities and volunteer work.
- Patients are encouraged to participate in social functions and positive interactions with family members, friends and relatives.

Box 8: Factors aggravating and relieving tinnitus (lifestyle changes).

A. **Factors aggravating tinnitus**

- Stress/fatigue
- Excessive noise exposure
- Upper respiratory tract infections and allergy
- Moving jaws/clenching teeth
- Head and neck trauma
- Changes in altitude
- Too much use of aspirin, alcohol, caffeine, acetaminophen, or ibuprofen
- Changes in body position
- Tobacco and marijuana

B. **Factors relieving tinnitus**

- Regular exercise
- Avoidance of noise exposure (use earplugs and earmuffs)
- Keeping oneself busy
- Personal relationships and socialization

- **Tinnitus retraining therapy (TRT):** It consists of counseling strategies and sound therapy. Counseling highlights the benign nature and neurophysiology of tinnitus and disengaging the tinnitus from emotions. Reassuring patient with the use of white noise generator. Gradual habituation reduces disabling nature of tinnitus.
- **Transcranial magnetic stimulation (TMS):** It induces low-level electric brain currents which may inhibit overexcited temporal lobe cortex that could be the source of subjective tinnitus.
- **Cognitive behavior therapy (CBT):** It is indicated in severe tinnitus and psychological distress. It tries to allay distorted beliefs regarding tinnitus.
- **Hypnotherapy:** It induces general relaxation that helps the patient to manage tinnitus more amicably.

Hyperacusis and Tinnitus

Usually all patients with hyperacusis eventually develop tinnitus as both the symptoms are due to altered auditory processing and decreased cochlear input.

Clinical Highlights and Additional Important Points

1. **Siegel's pneumatic speculum:** It provides magnified view of tympanic membrane (TM). It is used to test the mobility of the tympanic membrane. We can perform fistula test and introduce medicine into middle ear.
2. **Nerve supply of tympanic membrane:** Lateral surface is supplied by auriculotemporal nerve (CN V_3) and auricular branch of vagus. The medial surface is supplied by glossopharyngeal nerve.
3. **Nerve supply of the middle ear:** Glossopharyngeal nerves.
4. **Jacobson's nerve:** This branch of glossopharyngeal nerve supplies middle ear and mastoid air cells, and supplies secretomotor fibers to parotid. The section of this nerve relieves gustatory sweating.
5. **Referred otalgia:** The common causes of ear pain in the absence of ear disease include peritonsillar abscess, cancer of the pyriform fossa, temporomandibular joint (TMJ) dysfunction, and ulcer over the anterior two-thirds of tongue. In cases of carcinoma base of tongue referred ear pain is through the glossopharyngeal nerve and otic ganglion.
6. **Costen's syndrome:** Patient usually presents with referred otalgia, which may be associated with vertigo and tinnitus.

ANSWERS OF CRITICAL THINKING CASES AND QUESTIONS

Case Study 1

1. Right ear otomycosis.
2. The predisposing factors include a climate, instrumentation in the ear, prolonged use of topical antibiotics/steroid preparations.
3. Conductive hearing loss
4. Usually, it is a clinical diagnosis and no further investigations are required.
5. Ear should be cleaned under operative microscope or endoscope and the debris may be sent for microbiological study. Cultures are not routinely obtained as these patients generally respond well to treatment. Clotrimazole 1% lotion or cream is used after cleaning the canal.

Case Study 2

1. Left ear CSOM unsafe type with cholesteatoma
2. Conductive hearing loss with no sensorineural element.
3. The diagnosis of cholesteatoma is usually clinical and confirmed with microscope/endoscopy examination. Hearing assessment is done with Pure-tone Audiometry. HRCT temporal bone reveals extension of the disease. Ear swab is sent for culture and sensitivity test.
4. Modified radical mastoidectomy with/without tympanoplasty or combined approach tympanoplasty
5. As the cholesteatoma erodes the surrounding bones it can enter into the cranium and give rise to life-threatening intracranial complications, such as meningitis, sigmoid sinus thrombophlebitis, and brain abscess.

SELF-EVALUATION EXERCISES

1. Demonstrate the method performing otoscopy. What would be the different components of ear examination?
2. Describe the tympanic membrane examination and pneumatic otoscopy (siegelization)?
3. What are the differential diagnoses of a case of otalgia and what would be the components of your history taking and examination in such a case?
4. How many types of ear discharge do you know? What are their causes?
5. How will you take history and perform examination in a case of ear polyp?
6. Describe the classification and management of tinnitus?

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **Which of the following is not the function of Siegel's pneumatic speculum?**
   a. Provides magnified view of tympanic membrane
   b. Tests the mobility of the tympanic membrane
   c. Performs fistula test
   d. Introduction of topical medicine into middle ear if there is perforation in the tympanic membrane
   e. Test hearing
2. **Which of the following is not true regarding the nerve supply of middle ear?**
   a. Lateral surface of tympanic membrane is supplied by auriculotemporal nerve (CN V3) and auricular branch of vagus nerve
   b. Medial surface of tympanic membrane is supplied by glossopharyngeal nerve
   c. Nerve supply of the middle ear—glossopharyngeal nerve
   d. Jacobson's nerve is the branch of Vagus nerve.
   e. Jacobson's nerve supplies middle ear and mastoid air cells and supplies secretomotor fibers to parotid. The section of this nerve relieves gustatory sweating
3. **Which of the following disorder can cause only left side referred otalgia after physical exertion?**
   a. Peritonsillar abscess
   b. Cancer of the pyriform fossa
   c. TMJ dysfunction
   d. Ulcer tongue
   e. Coronary artery disease

True (T)/False (F)

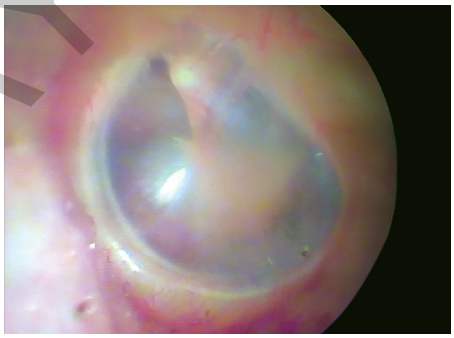
4. **Patients with Costen's syndrome usually present with referred otalgia, which may be associated with vertigo and tinnitus.**
5. **In cases of carcinoma base of tongue, referred ear pain is through the vagus nerve.**

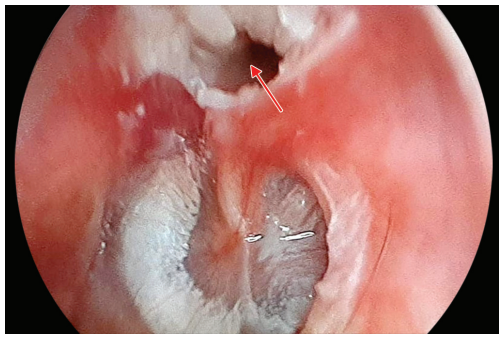
ANSWERS

1. e 2. d 3. e 4. T 5. F

FIGURE-BASED QUESTION

Normal tympanic membrane (TM)





CSOM with attic cholesteatoma

Note: Tympanosclerotic patch on pars tensa of TM

(*Courtesy:* Dr Swapna A Shedge, KIMS, Karad).

Questions	Answers
1. What is the type of this tympanic membrane perforation (red arrow)?	1. Attic perforation
2. What is the cause of this perforation?	2. Unsafe CSOM with Cholesteatoma

Diseases of Ear, Nose & Throat

Salient Features

- Updated as per CBME curriculum by NMC.
- Competency numbers included in the table of contents as well as in the chapters.
- Each chapter begins with the details of the subject competencies.
- Case studies incorporated liberally in the chapters and additional problem-based cases provided in the appendix.
- Instructive boxes, tables, flowcharts, line diagrams and photographs to enhance learning.
- Numerous carefully drawn colored illustrations enhancing understanding and retention of facts.
- Clinical applications highlighted and integrated in the text.
- Comprehensive and of broader scope book designed for students, residents and practitioners.
- Balanced presentation of content and emphasis on the practical features of clinical diagnosis and patient management.
- Brevity, conciseness, readable format, up-to-date discussions and easy accessibility of key information.
- Each chapter has sets of objectives (competencies) which students are supposed to answer after going through the section/chapter which would facilitate the targeted and attentive reading.
- For the quick revision of students, chapters end with the clinical highlights and additional important points.
- The self-evaluation exercises, multiple-choice questions (MCQs), true or false, fill in the blanks, figure-based questions and matching are especially prepared for answering frequently asked MCQs (PGME, USMLE and PLAB), short-answer questions and oral/viva questions.
- Appendix having clinical secrets, key points and problem-oriented cases.
- Complimentary question book comprising of NMC pattern theory questions: long and short answer questions, reasoning type questions, clinical case scenario-based questions and more than 1000 MCQs including reasoning and clinical types.

Mohan Bansal got his bachelor and master degrees (MBBS and MS) from Sardar Patel Medical College, Bikaner, Rajasthan, India and a PhD from BJ Medical College, Ahmedabad, Gujarat, India. He is a Fellow of the American College of Surgeons (FACS). As a Guest Professor, Department of ENT, he has taught international medical students in Clinical College of Dali University in Yunnan PR of China. He has been the Chairman (2015–2017) of Editorial Board of Indian Journal of Otolaryngology and Head and Neck Surgery, which is an official publication of the Association of Otolaryngologists of India (AOI). He has made contributions to otolaryngology as a teacher, educator, author and consultant. He has been teaching faculty in many colleges and visiting ENT consultant to tertiary care corporate hospitals (Shalby Hospital, Rajasthan; SAL and Apollo Hospitals, Ahmedabad, Gujarat; and Zydus Hospital, Anand, Gujarat). In addition to many guest lectures, presentations and publications of scientific papers and chapters in books, he has two prestigious books to his credit: (1) Diseases of Ear, Nose & Throat (2013 and 2018), Jaypee Brothers; (2) Medical Informatics: A Primer (2003), Tata McGraw-Hill.

Professor Bansal has participated, directed and organized conferences, seminars, symposia and workshops at the state, national and international levels and chaired scientific sessions and held key positions in many organizations. He has many international awards and scholarships to his credit: Garnett Passe Scholarship to attend and present his work in the XVI World Congress (1997) of International Federation of Oto-Rhino-Laryngology (IFOS) at Sydney in Australia; Member of the Group Study Exchange (GSE) team (1997) of Rotary Foundation to USA. He was the first Indian who got selected for USA's National Library of Medicine (NLM) Fellowship Program in Medical Informatics and attended its Fall Course (2001) at Marine Biological Laboratory (MBL) Woods Hole, Boston, MA, USA. He is well traveled and has been to more than 20 countries of the world. He was member of the IMA's study tour to South East Asia (Thailand, Singapore and Hong Kong) coinciding with WONCA (1995). He got SD Parikh Award for the best paper (Computer-assisted Diagnosis in Ear, Nose & Throat Diseases) during the Silver Jubilee Conference of Association of Otolaryngologists of India (AOI) in 2002 in Surat, Gujarat.

Shelving Recommendation
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