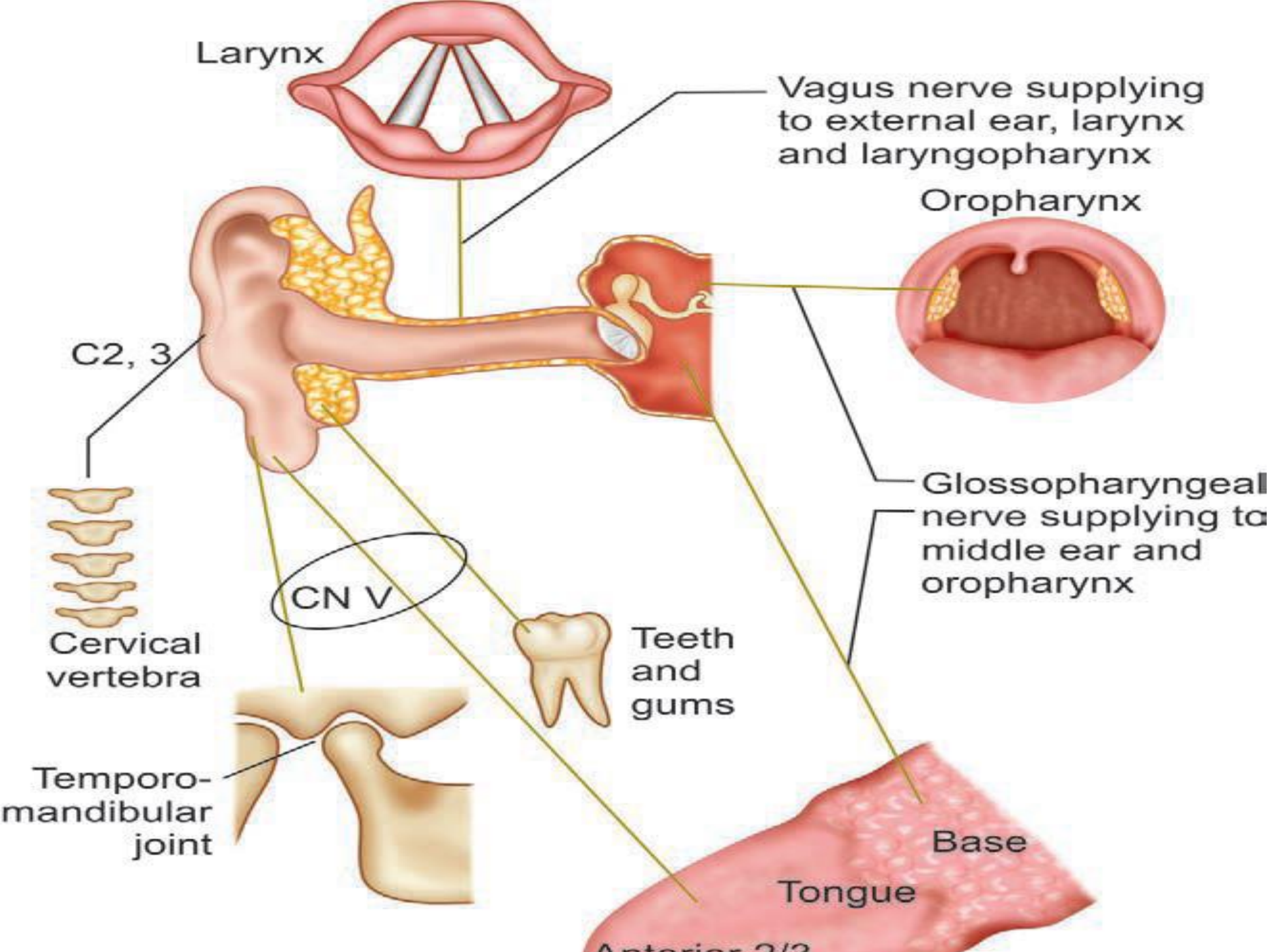
OTALGIA (EARACHE)

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 otalgia***: The secondary otalgia is referred from the head and neck regions, which are innervated by the nerves that also supply to ear .


Larynx
Vagus nerve supplying to external ear, larynx and laryngopharynx
Oropharynx
C2, 3
Glossopharyngeal nerve supplying to middle ear and oropharynx
CN V
Cervical vertebra
Teeth and gums
Temporo-mandibular joint
Base
Tongue

1-Area supplied by CN V (trigeminal nerve)

- **Dental and periodontal diseases*:** Caries tooth, apical abscess, impacted 3rd molar, malocclusion.
- **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. 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
  - **Nasopharynx**: Infection and tumors and after adenoidectomy

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. 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***

OTORRHEA

Otorrhea1, which refers to discharge from the ear, is a very common otologic complaint.

Types of Discharge and their Causes

- ***Mucopurulent***: Acute suppurative otitis media (ASOM) and chronic suppurative otitis media (CSOM)

Serous: Eczematous otitis externa (OE)

Sanguineous (blood tinged): ASOM, granulations, trauma, tumors

Purulent foul smelling : Cholesteatoma

Watery: Watery otorrhea, which may be copious, intermittent, suggests a cerebrospinal fluid (CSF)

History

Otorrhea may be profuse or scanty and continuous or intermittent.
Otorrhea from acute suppurative otitis media mabe bloody, mixed with mucus, or mucopurulent and typically short-lived

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.

Examination

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

- *Otitis externa*: It tends to delay a thorough ear microscopic examination because of edema, debris and tenderness.
- *Foreign body*: An unsuspected FB 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.

3. *Culture and sensitivity*:

a. *Cautions:*

i. Topical antibiotic should be stopped before taking the sample for culture and sensitivity as they will affect the culture growth.

ii. In refractory cases of infective otorrhea and myringotomy tube, sample should be taken from deep in the EAC or from a perforation.

b. *Microorganisms*:

i. *Most common microorganisms causing OE* are *Pseudomonas aeruginosa* (in malignant or necrotizing OE) and *Staphylococcus aureus*.

4. *CT imaging*: Preoperative CT imaging is important in cases of EAC stenosis (congenital, traumatic or neoplasms) with cholesteatoma.

5. *Biopsy*: It is required to know the nature of neoplasms.

a. *Contraindication:* In cases of glomus tumors it should be avoided as it can result in profuse bleeding.

6. *Immunodeficiency and allergy*: Identifying underlying immunodeficiency or allergy should be considered in refractory cases

Deafness means inability to hear and is of four types namely :

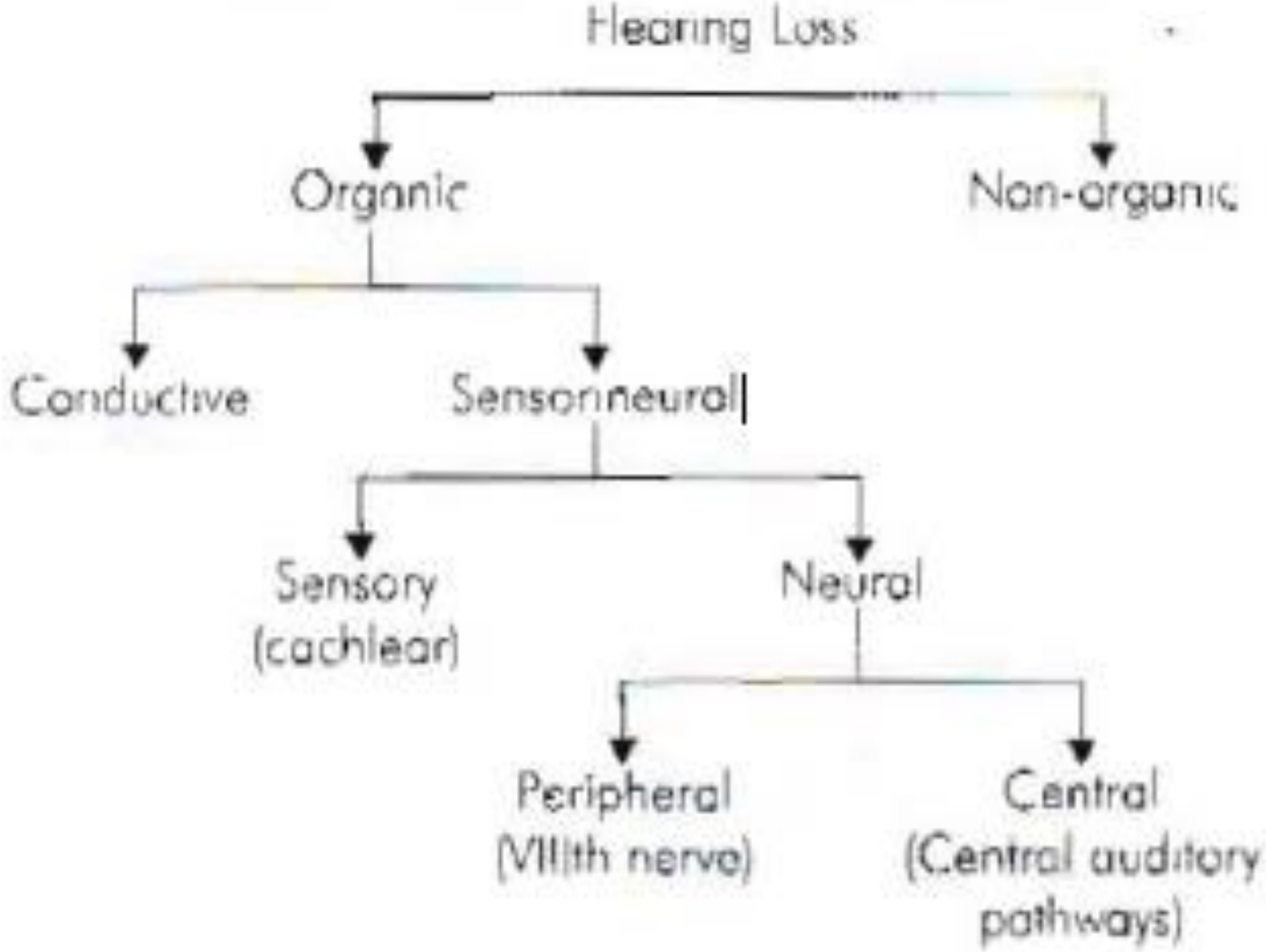
1-conductive

2-SNHL

3-Mixed (conductive and perceptive)

4-Non-organic(hysterical)

CLASSIFICATION



Conductive hearing loss

The disorders of external and middle ear up to stapediovestibular joint interfere with the conduction of sound and cause CHL

The ossicular disorders with intact tympanic membrane cause more hearing loss than ossicular diseases with tympanic membrane perforation.

Causes of conductive deafness

1-causes in the external ear

2-causes in the middle ear

Congenital

1-Crouzon's syndrome: conductive deafness is due to external canal atresia and middle ear abnormalitise

2-Wildervanck syndrome: conductive deafness is due to fusion or other malformation of the ossicular chain is associated with pre auricular sinuses pre auricular appendages and malformation of auricle

3-Treacher collins syndrome: an hereditary malformation of the lower face in which the malar bonse ,maxillae and mandible are hypoplastic with varying degrees of developmental failure of the external and middle ears it may be unilateral or bilateral

4-The van der Hoeve syndrome:

The triad of osteogenesis imperfecta, otosclerosis and blue sclera.

External auditory canal: Wax, foreign bodies, otitis externa,congenital and acquired stenosis, exostoses, osteomas,tumors, cyst

- ***Tympanic membrane***: Perforations (traumatic, ASOM, CSOM), tympanosclerosis, retraction
- ***Ossicles***: Fixation (otosclerosis, tympanosclerosis, adhesive otitis media, congenital); discontinuity (traumatic, inflammatory, cholesteatoma)
- ***Middle ear***: Otitis media with effusion , Bara traumatic otitis med hemotympanum, cholesteatoma, tumors (benign :glomus tumour (chemodectoma) ,malignant:squamous cell carcinoma), Eustachian tube dysfunction

Sensorineural hearing loss (SNHL):

pathwaySensorineural hearing loss (SNHL) results from lesions of the cochlea, 8th nerve and central auditory s.

Etiology

1. Congenital: Genetic and nongenetic
2. Infections (viral, bacterial or spirochetal): Labyrinthitis and meningitis
3. Trauma to labyrinth and cranial nerve (CN) VIII in fractures of temporal bone and ear surgery.
4. Ototoxic drugs: Streptomycin, gentamicin
5. Endolymphatic hydrops: Primary or idiopathic (Meniere's disease) and secondary
6. Tumors: CN VIII acoustic neuroma

7. Systemic diseases: Diabetes, multiple sclerosis, syphilis, hypothyroidism, kidney disease, autoimmune disorders, blood dyscrasias
8. Miscellaneous: Sudden idiopathic sensorineural hearing loss (SNHL), familial progressive SNHL, noise-induced hearing loss (NIHL), presbycusis

Audiology

Audiology refers to the study of hearing disorders through the hearing evaluation as well as the rehabilitation of the patients with hearing impairments.

Sound

Sound is a form of energy, which is produced by any vibrating object. sound wave is produced by compression and rarefaction of molecules of the medium in which it travels such as air, liquid, solid. Velocity of sound in the air, at 20°C, at sea level, is 344 meters (1,120 feet) per second. Velocity of sound is faster in liquid and fastest in solid medium.

Frequency and Pitch

Frequency refers to the number of cycles per second. Its unit Hertz (Hz) is named after a German scientist Heinrich Rudolf Hertz. A sound of 500 Hz means 500 cycles per second. Pitch is a subjective sensation that is produced by frequency of sound. Higher the frequency, greater is the pitch.

Pure Tone and Complex Sound

A single frequency sound is called a pure tone such as 250, 500 or 1,000 Hz. In pure tone audiometry (PTA), thresholds of hearing in decibels for various pure tones from 250 to 8,000 Hz are measured. The sound, which has more than one frequency, is called a complex sound such as voice and speech.

Intensity and Loudness

The intensity is the strength of sound and determines loudness. The unit of intensity of sound is decibel (dB). Loudness is a subjective sensation produced by intensity. Greater the intensity of sound more is the loudness. At 1 m distance following are the intensities of different types of speech (Table 1).

Decibel

Decibel is 1/10th of a bel1. Decibel represents a logarithmic ratio between two sounds (sound being described and the reference sound).

METHOIDS OF HEARING TESES

The history taking and complete ear, nose, throat, head and neck examination and general evaluation of other systems are mandatory before performing the different types hearing tests

1. *Traditional Screening Tests*

a. Watch test
b. Finger friction tests
c. Voice Tests (conversation and whisper)

2. *Tuning Fork Tests*

a.Rinne test
b. Weber test
c. Absolute bone conduction (ABC)
d. Schwabach's test
e. Bing test
f. Gelle's test

3. *Audiometric Tests*

a. Pure tone audiometry (PTA)

b. Impedance audiometry

i. Tympanometry

ii. Acoustic reflex measurement

4. *Evoked Response Audiometry*

a. Brainstem Evoked Response Audiometry (BERA)

b. Electrocochleography (EcoG)

5. *Otoacoustic emissions*

6. *Central auditory tests*

7. *Hearing evaluation in infants and children*

*****Tuning Fork Tests

These tests are performed with tuning forks of different frequencies such as 128, 256, 512, 1024, 2048 and 4096 Hz, but for routine clinical practice, tuning fork of 512 Hz is ideal. Forks of lower frequencies produce sense of bone vibration while those of higher frequency have a shorter decay time and are thus not routinely preferred. A tuning fork is activated by striking it gently against the examiner's elbow, heel of hand or the rubber heel of the shoe.

To *test air conduction (AC)* a Vibrating fork is placed vertically, about 2 cm away from the opening of external auditory meatus. The sound waves are transmitted through the tympanic membrane, middle ear and ossicles to the inner ear. Thus, by the air conduction test the function of both the conducting mechanism and the cochlea are tested. Normally, hearing through air conduction is louder and heard twice as long as through the bone conduction route.

To *test bone conduction (BC),* the fOOEplate of vibratining tuning fork is placed firmly on the mastoid bone Cochlea is stimulated directly by vibrations conducted through the skull bones. Thus, BC is a measure of the cochlear function only.

(a) Rinne test. In this test air conduction of the ear is compared with its bone conduction. A vibrating tuning fork is brought beside the patient's meatus about 2cm and when he stops hearing, it is placed on the mastoid .the patient is asked compare the loudness of sound heard through air and bone conduction.

. Rinne test is called positive

when AC is longer or louder than BC. It is seen in normal persons or those having sensorineural deafness.

Rinne test is called Anegative (BC > AC) is seen in conductive deafness.

A negative Rinne indicates a minimum air-bone gap of 15-20 dB.

False negative Rinne.

It is seen in severe unilateral sensorineural hearing loss. 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 ear because of transcranial transmission of sound. In such cases, correct diagnosis can be made by masking the non-test ear with Barany's noise box while testing for bone conduction. Weber test will further help as it gets lateralised to the better ear.

****Weber test.** In this test, a Vibrating tuning fork is placed in the middle of the forehead or the vertex and the patient is asked in which ear the sound is heard.

Normally, it is heard equally in both ears. It is lateralised to the worse ear in conductive deafness and to the better ear in sensorineural deafness.

1. Pure Tone *Audiometry*

An audiometer is an electronic device which produces pure tones, the intensity of which can be increased or decreased in 5 dB steps (Fig. 4.2). Usually air conduction thresholds are measured for tones of 125,250,500,1000, 2000 and 4000 and 8000 Hz and bone conduction thresholds for 250, 500, 1000 and 2000 and 4000 Hz. The amount of intensity that has to be raised above the normal level is a measure of the degree of hearing impairment at that frequency. It is charted in the form of a graph called *audiogram.* The threshold of bone conduction is a measure of cochlear function. The difference in the thresholds of air and bone conduction (A-B gap) is a measure of the degree of conductive deafness. It may be noted that audiometer is so calibrated that the hearing of a normal person, both for air and bone conduction, is at zero dB and there is no A-B gap, while turning fork tests normally show AC > BC

• Pure Tone Audiometry

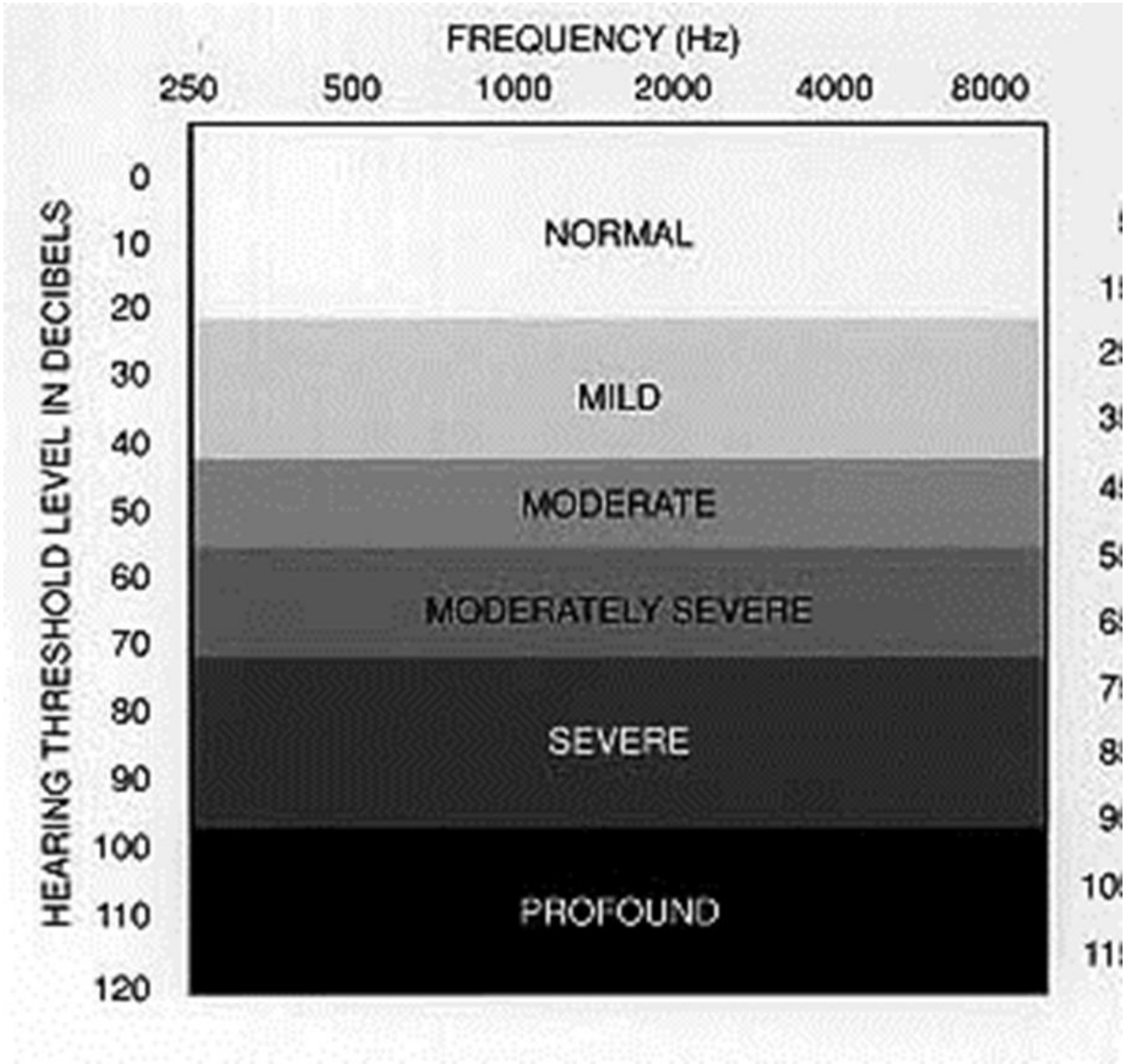
✣ VALUE :

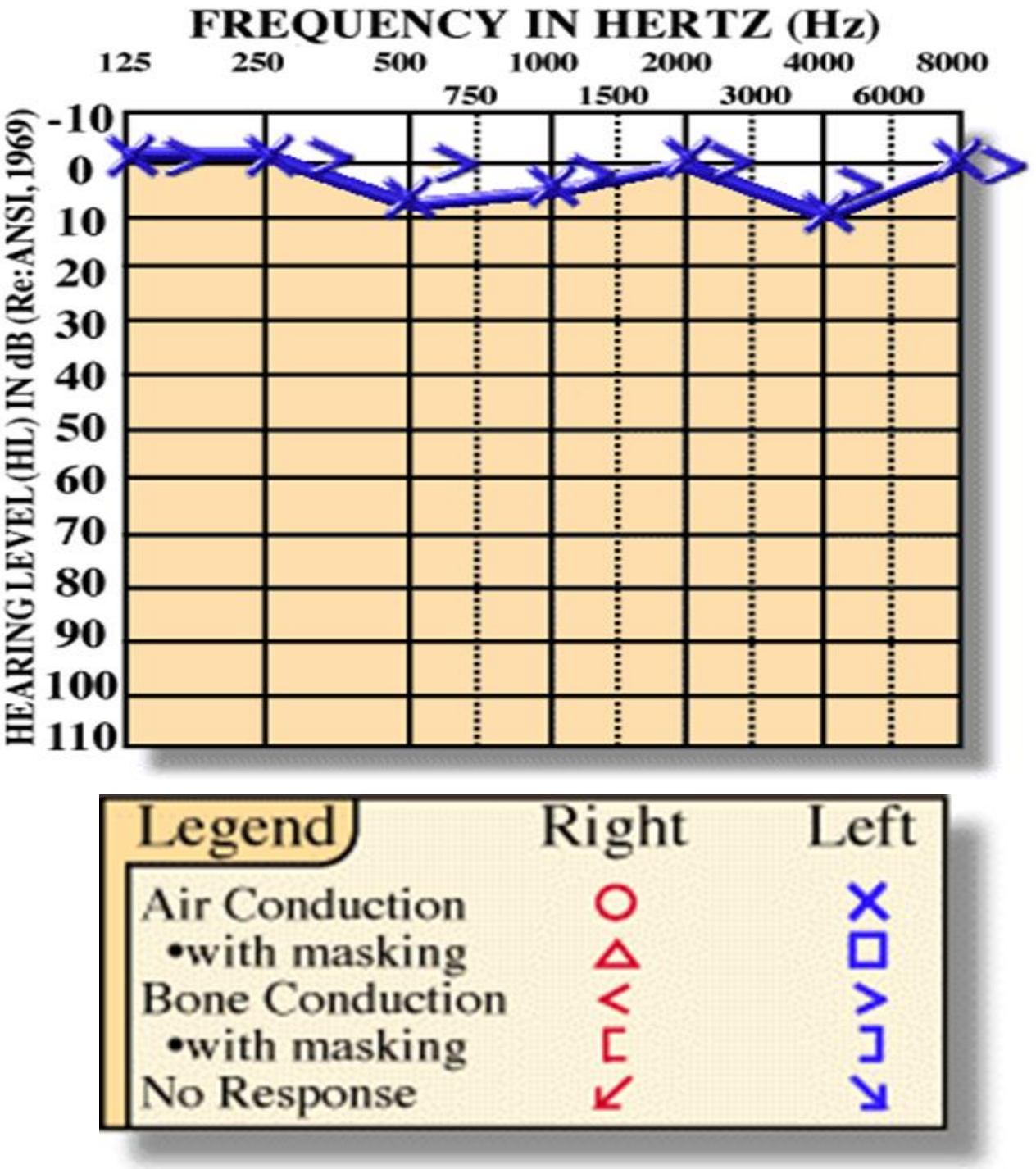
Usefull for diagnosis of:

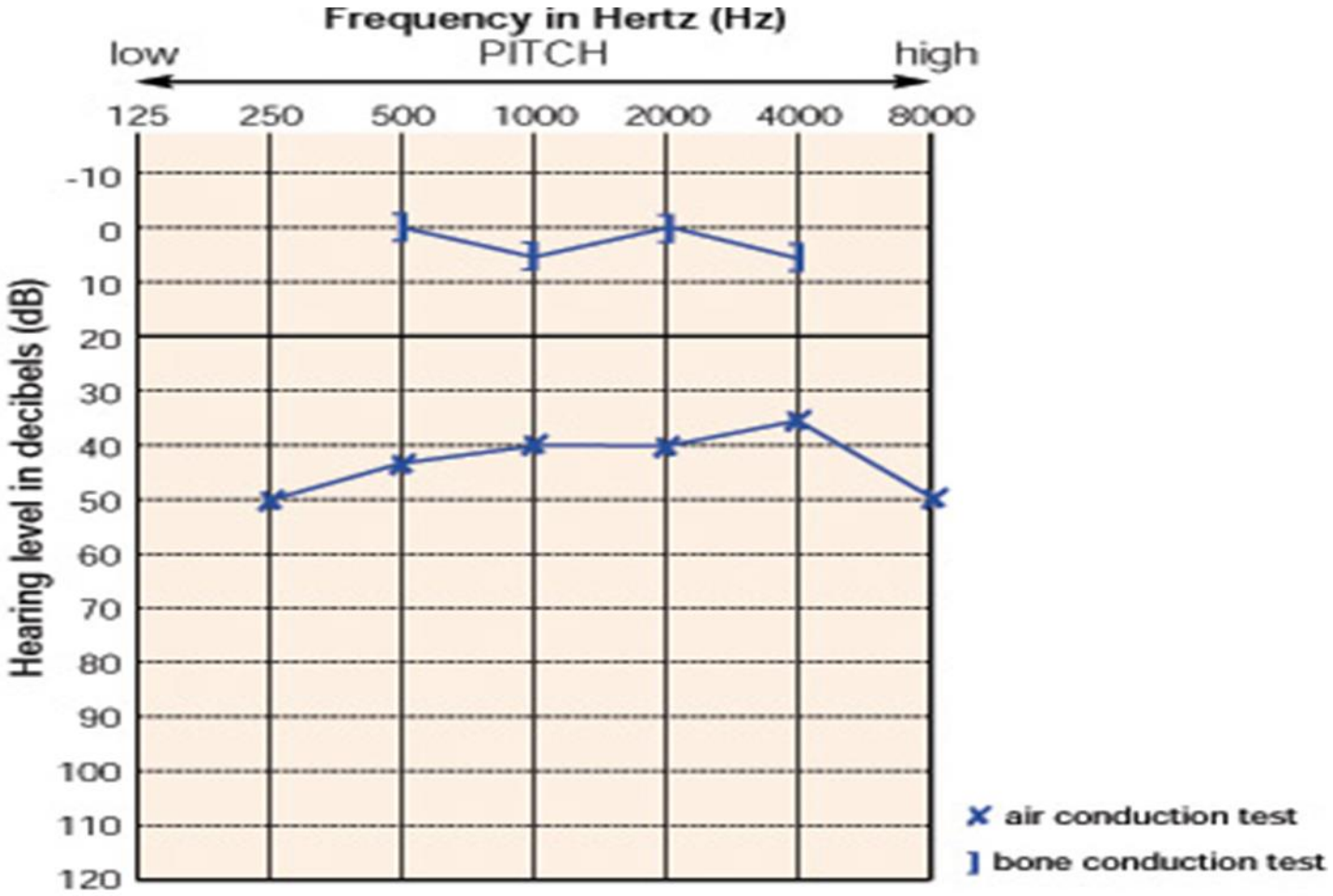
1- **Degree** of Hearing **Loss** (mild, moderate severe or profound)

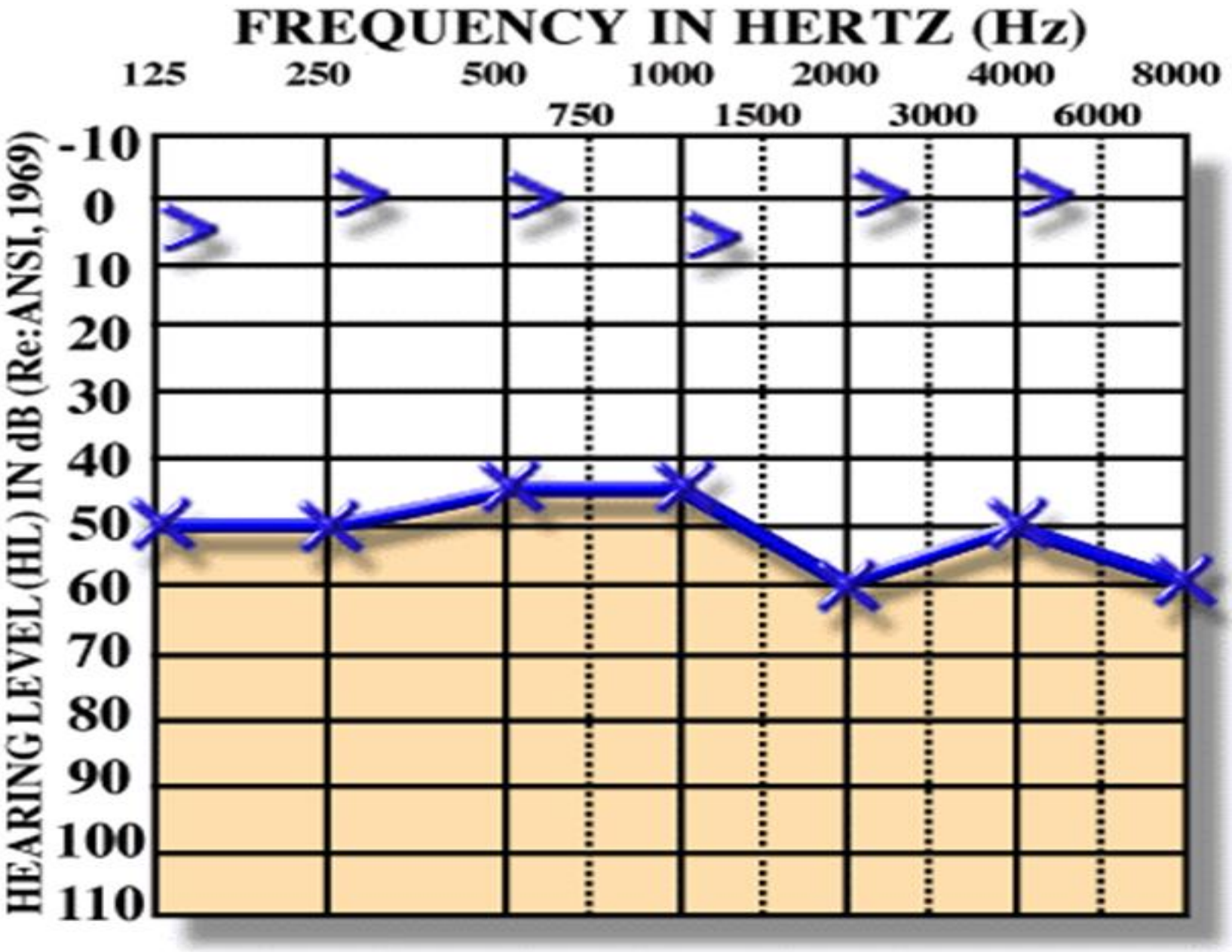
2-**Type** of Hearing loss, (CD, SNHL Or Mixed)

Degree of Hearing loss

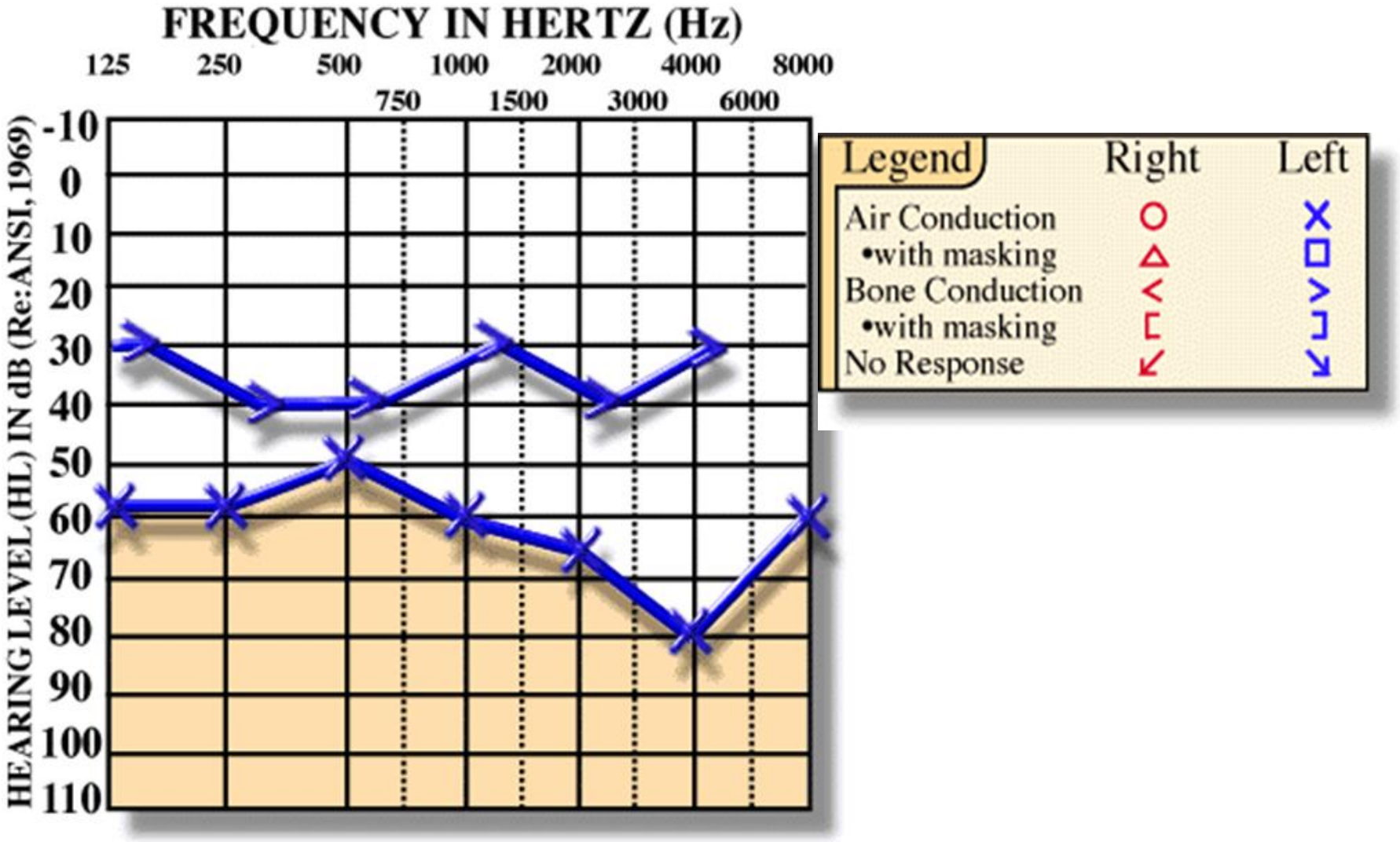



FREQUENCY IN HERTZ (Hz)
125
250
500
750
1000
1500
2000
3000
4000
6000
8000
HEARING LEVEL (HL) IN dB (Re:ANSI, 1969)
-10
0
10
20
30
40
50
60
70
80
90
100
110
Legend
Right
Left
Air Conduction
•with masking
Bone Conduction
•with masking
No Response

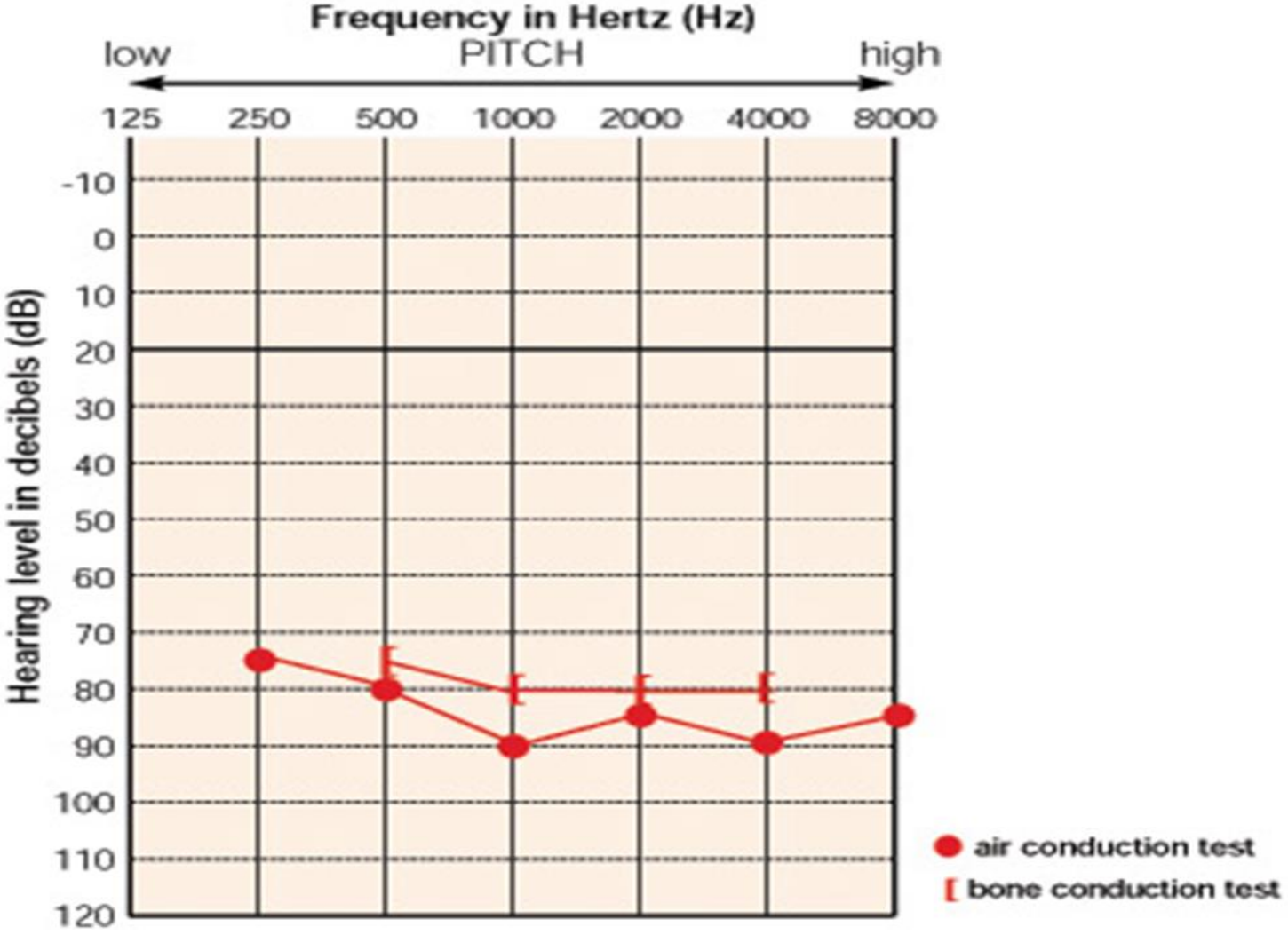

Frequency in Hertz (Hz)
low
PITCH
high
125
250
500
1000
2000
4000
8000
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
Hearing level in decibels (dB)
air conduction test
bone conduction test


FREQUENCY IN HERTZ (Hz)
125
250
500
750
1000
1500
2000
3000
4000
6000
8000
HEARING LEVEL (HL) IN dB (Re:ANSI, 1969)
-10
0
10
20
30
40
50
60
70
80
90
100
110

Mixed conductive and sensorineural hearing loss



- The audiogram here shows a severe SN hearing loss.



When difference between the two ears is 40 dB or above in air conduction thresholds, the better ear is masked to avoid getting a shadow curve from the nontest better ear.. Masking is done by employing narrow-band noise to the non-test ear.

Uses of *pure tone audiogram*

(i) It is a measure of threshold of hearing by air and bone conduction and thus the degree and type of hearing loss.

(it) A record can be kept for future reference.

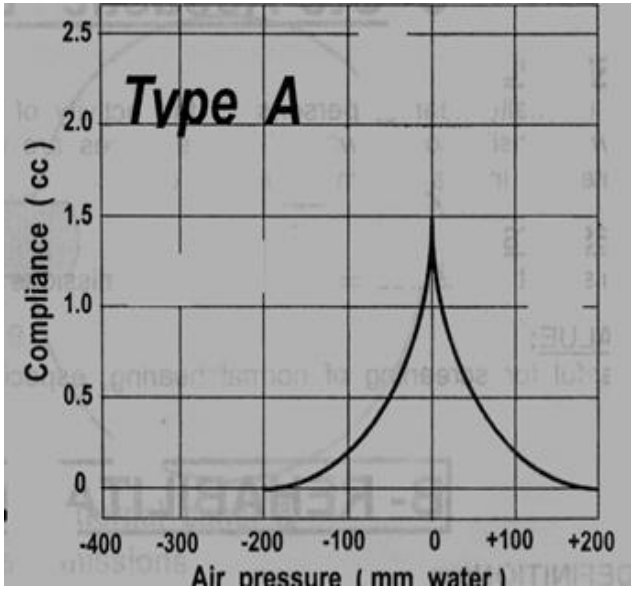
(iii) Audiogram is essential for prescription of hearing aid.

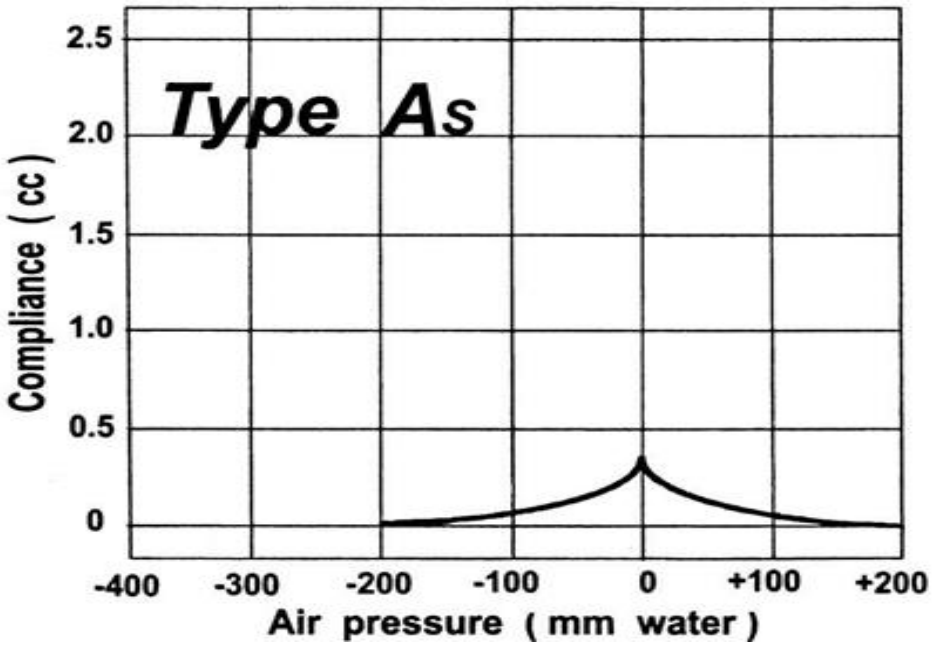
Tympanometry.

This is the measurement of middle ear pressure through measuring the mobility of the TM(compliance).

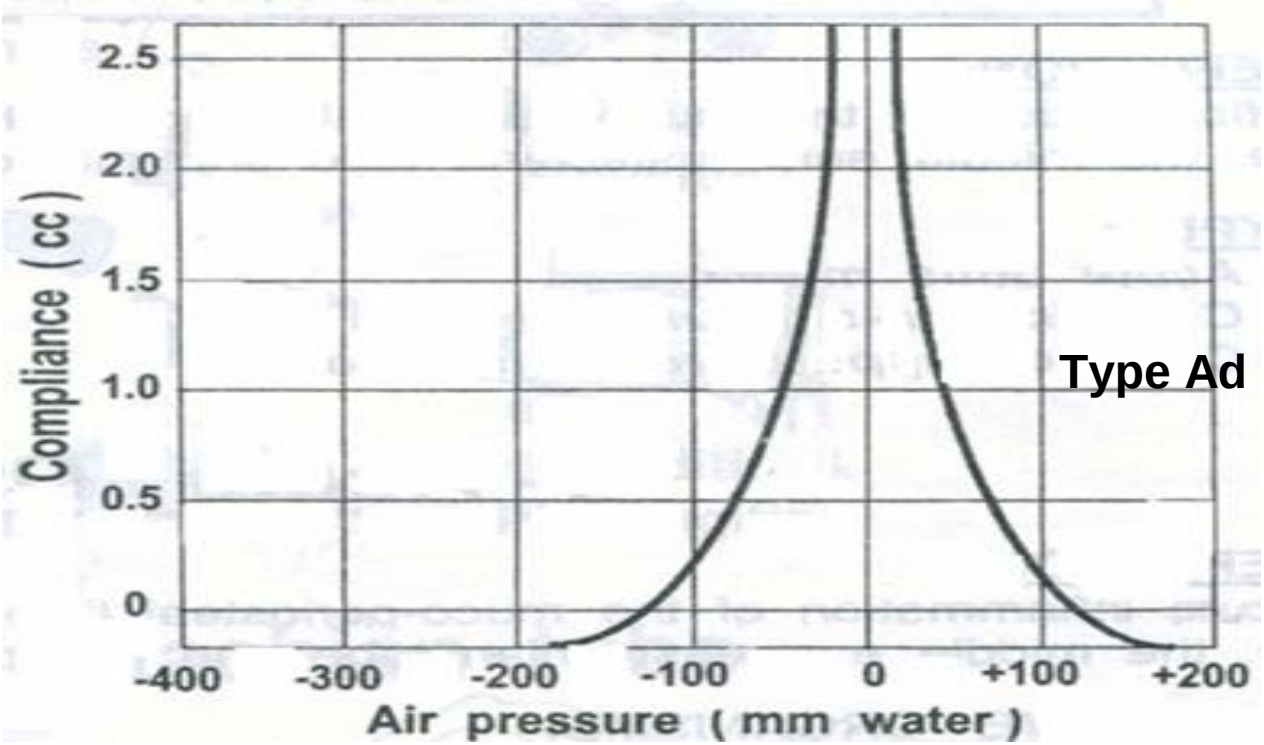
Types of tympanograms (Fig. 4.6)
Type A Normal tympanogram.

Type As **tympanograms** the pressure is normal but the compliance is reduced ,Seen in *fixation* of *ossicles,* e.g. otosclerosis
or malleus fixation.





Type Ad **tympanograms** the pressure is normal but the compliance is increased ,Seen in *ossicular disruption or dislocation*



Type B **tympanograms (flat curve)**

This occurs in secretory otitis media

Type C **tympanograms**

Normal compliance with negative pressure occurs ET dysfunction