

## Deafness

**Introduction:**

- Vision and hearing are both important it's like oxygen and water both important , can't compare.
- A lot famous blind people on the other hand there is no single famous deaf .
- Beethoven become deaf after playing piano not before, he saw no meaning for life after he became deaf.
- Bout the specialty
  - Before it was ENT (Ear Nose and Throat), now it is **otoo...etc**
  - diverse
  - highly compatible
  - the guardians of airway
  - medicine, surgery, and psychiatry
- **in Quran**

- القرآن معجزة سمعية
- تحدوا به العرب
- ذكر السمع 155 مره ، البصر 88
- دائما تقدم ذكر السمع على البصر، فسره العلماء بأنه تقديم
- تشريفي (38 مره ذكر السمع مع البصر)
- أول حاسة
- – الجنين يسمع في الشهر الخامس من الحمل
- – يبصر جيداً بعد الولادة بعشرة اسابيع
- آخر حاسة
- – قال صلى الله عليه وسلم ( إذا وضع الميت في قبره
- وانصرف الناس عنه إنه ليسمع قرع نعالهم وهم عنه
- (مدبرون)
- أقوى حاسة
- – يفقد البصر قبل السمع في النوم والتخدير والاعماء
- – تخترق الجدار
- أوسع احساساً

- ٣٦٠ درجة البصر ١٨٠ درجة أفقية و ١٤٥ درجة عمودية

- أكثر حماية
- عمق الاذن الداخلية وفي العظم الصخري
- منطقتين في المخ
- أكثر تأثيراً
- فقد الكلام
- فقد التواصل والتعلم

**To hear voice we need:**

1. Intact tympanic membrane
2. Ossicular chain
3. 2 functioning windows
4. Acoustic separation of 2 windows
5. Functioning Eustachian tube
6. Functioning sensor neural apparatus

**How common is hearing loss**

Overall about 1 in 10

- 1 in 3 adults 65 - 75
- 1 in 2 older than 75
- 1-2% school age children
- 4% children under 5

Commonest congenital anomaly (Important)

**Signs of Hearing Loss**

1. Talking louder than necessary (to hear themselves, accused of being angry not replaying to other)
2. Turning up volume on the TV or radio
3. Complaints that other people “mumble”(lack insight)
4. Confusion of similar sounding words نخلة / نخلة
5. Inappropriate responses in conversation
6. Ringing or buzzing in the ears
7. Lip Reading
  - a. Watching a speaker’s face intently
8. Difficulty “hearing” someone behind
9. Tinnitus (they don’t hear what they are supposed to hear and hear unwanted voices)
10. Having difficulty on the telephone (can't read lips)
- 11.

**-effects**

- Don’t enjoy conversations – too much work
- People think you are an idiot
- Scared to try new contacts
- Scared to take new jobs

- Limits your world
- Embarrassed (people make fun of deaf person but not a blind one)
- People think that they hear what they want
- Limited relations (limit your world, it gets smaller)

### Examination :

#### 1- Clinical

- ✓ By talking to the patient, the examiner quickly appreciate how well a patient can hear and this assessment continues throughout the interview.
- ✓ A more formal assessment is then made by asking the patient to repeat words spoken by the examiner at different intensities and distance in each ear in turn

#### 2- Tuning fork test

##### ✓ RINNE'S test:

- this test compares the relative effectiveness of sound transmission through the middle ear by air conduction(AC), and bypassing the middle ear by bone conduction (BC). It's usually performed as follows :
- a tuning fork of 512 Hz (cycles per second) is struck and held close to the patient's ear; it is then placed firmly on the mastoid process sand patient is asked to state weather it's better heard by AC or BC.
- **Interpretation of the test:**
  - If  $AC > BC$  : Rinne positive (the middle and outer ear are functioning normally)
  - If  $BC > AC$  : Rinne negative (there is a defective functioning of the outer or middle ear
- Rinne's test tells you little or nothing about cochlear functioning. It is a test of middle ear functioning.

##### ✓ WEBER'S test:

- This test is useful in determining the type of deafness a patient may have, and detecting which ear has the better functioning cochlea. The base of a vibrating tuning fork is held on the vertex of the head and the

patient is asked whether sound is heard centrally or is referred to one ear.

1. In conductive deafness the sound is heard in the deafer ear
2. In sensorineural deafness the sound is heard in the better hearing ear

### 3- Audiogram

✓ see audiology lecture

- deafness by itself means profound hearing loss
- the term hearing loss may vary from mild to profound

### Hearing Loss

- limit activities
- Isolation
- Depression
- Anxiety
- Insecurity "اذا كانوا ثلاثة فلا يتناجى اثنان دون ثالثهما"
- strain relationships
- Increases psychosocial difficulties

**Recruitment:** out of proportion (loud noise)

- Explanation : when a person suffer from hearing loss he/she can't hear normal voice, so people start raising their voices until they can hear (which is a loud sound), the person will hear it louder than it is, due to cochlear problem in tuning sound, along with transmission problem.

**Note :**

- In external and middle ear problem patient will have a conductive hearing loss. (the most common cause is wax, and usually it is due to Q tip cleaning)

### Conductive hearing loss (CHL)

- Abnormality before the cochlea
- Bone conduction > air conduction
- -ve renne, weber's lateralize to the affected side
- Low frequencies are more affected
- Speech discrimination is good

Causes:

- Causes are classified according to the site :

1- External ear: obstruction (must be complete to cause deafness) eg: wax, tumor, FB

2- Middle ear:

- Membrane >> perforation
- Ossicle
  - Disruption
    - With intact TM
    - With perforated tympanic membrane (better prognosis)
  - Fixation
- Mass occupying middle ear cavity (tumor, fluid)
- Eustachian tube abnormality

• **List of causes**

1. Wax & foreign bodies (FB usually in children)
2. Otitis externa (inflammation which cause blockage of the canal)
3. Ear drum Scarring; perforation (it has a medico-legal important)
4. Otitis media (ASOM)
  - a. Acute suppurative
  - b. Otitis media with effusion (OME)
  - c. Chronic otitis media (CSOM)
5. Otosclerosis
6. Ossicular chain disruption
7. Microtia (ear deformity) = الأذن الصمغاء
8. Trauma
  - a. Skull base fracture (battles sign , raccoon eye)
9. Atresia = الرتق : وهو الشيء المسدود أو الملتئم
10. Drum retraction : adhesive OM
  - Treated surgically by placing otic tube
  - It is like a balloon >> air >> suction
11. Middle Ear Effusion MEE (fluid effusion >>CHL)
12. tympanic sclerosis:
  - white area that prevent vibration >>CHL
  - It is a sign of old ear infection
13. otosclerosis

- Disease of stapes(the smallest bone)
- Inherited
- 10% otosclerotic lesions (10%
- symptomatic)
- Worse during pregnancy (hormone related)
- Middle-age
- Females: Male 2: 1
- Stapedectomy(treatment)

Treatment:

- 1- Remove the obstruction
- 2- Removal of fluid (myringotomy?)
- 3- Removal of mass ME >> tympanotomy
- 4- Stapedectomy (ossiclesclerosis)
- 5- Tympanoplasty (myringoplasty +ossiculoplasty)
- 6- Hearing aid (if surgery is not possible)

**Sensory-neural hearing loss (SNHL)**

- Lesion in the cochlea >VII n.>> central pathway
- AC < BC
- Rennie +ve test, weber lateralize to the better side
- Often involving high frequencies

**-causes:**

1. Congenital

- a. Deafness affects 0.2%
- b. • SNHL attributed to
  - i. 50% genetic factors
  - ii. 20-25% environmental
  - iii. 25-30% sporadic
- c. • Genetic
  - i. – 75% AR
  - ii. – 20% to AD
  - iii. – 5 % X-linked
- d. • Over 400 syndromes
- e. Common in KSA

2. Trauma: fracture of temporal bone

3. Infection

- a. Viral (by blood)

- b. Organism : measles mumps, and CMV
- c. Bacterial:
  - i. Tympanogenic
  - ii. Meningogenic
- d. Syphilitic
  - i. Sudden SNHL
  - ii. +ve fistula test Hennbert's test
  - iii. VDRL +ve
  - iv. Rx: penicillin +steroid
- 4. acoustic trauma (single brief exposure to single intense sound 140-170 db)
- 5. Noise (Noise induced hearing loss)
  - a. Boilermaker's deafness (industrial)
  - b. The employee is not protected in KSA
  - c. one of the most common occupationally
  - d. induced disabilities
  - e. chronic exposure to lesser intense sound
  - f. either temporary or permanent HL
  - g. audiogram : characteristic notch at frequency of 4000 Hz in both AC and BC
  - h. damage hair cells, starting in basal cochlea, outer hair cells are affected earlier
  - i. sudden HL
  - j. develop over hours or few days
  - k. maybe partial or complete
  - l. it's unilateral most of the times
  - m. damage happens (talking 60-70 db)
    - i. 90 db for 8 hours
    - ii. 95 db for 4 hours
    - iii. 100 db for 2 hours
    - iv. 105 db for 1 hours
  - n. Tinnitus (first sign)
    - i. commonly accompanied NISNHL
    - ii. warning sign
  - o. treatment:
    - i. bed rest
    - ii. vasodilating agent



iii. low molecular weight dextran (but it's contraindicated in patients with HF, or bleeding disorder).

p. Prognosis: 50% will recover after 5 days

6. Ototoxic(a lot of medication can cause)

- Drugs :
  - Antibiotics
  - Diuretics (loop diuretics)
  - Antineoplastics
  - Antiinflammatories
  - Antimalarial agents
  - Ototoxic agents
  - Others
- Risk factor:
  - i. Renal failure (Elevated peak and trough levels)
  - ii. Liver failure
  - iii. Immunocompromise
  - iv. Collagen-vascular disorders
  - v. Advanced age (> 65 years)
  - vi. Prior ototoxicity
  - vii. Concurrent use of known ototoxic agents
  - viii. Preexisting HL or Vestibular
  - ix. Bacteremia (fever )
  - x. Treatment course longer than 14 days
  - xi. + ve FHx of AG ototoxicity

7. Presbycusis

- a. age related hearing loss(like visual loss related to age)
- b. deafness , tinnitus , recruitment
- c. hearing loss

8. Acoustic neuroma

9. Menier's disease

10. systemic disease

**Diagnosis:**

- History
- Audiogram

- Investigation

**Treatment:**

- Treat the underlying cause

**The deaf child:**1- Prenatal

- a. Before birth:disease to infant or mother
- b. Infant :
  - i. Hiebe's disease :
    1. Most common in inner ear anomaly
    2. Dysplasia only in cochlea+ saccule , cochleosaccular junction
    3. Autosomal recessive syndrome
  - c. Maternal factor
    - i. Infection
      1. TORCHES
      2. Drugs :
        - a. aminoglycoside + quines
        - b. thalid amide (limb , heart, face)
      3. radiation : 1<sup>st</sup> trimester
      4. other (DM , thyroid , alcohol)

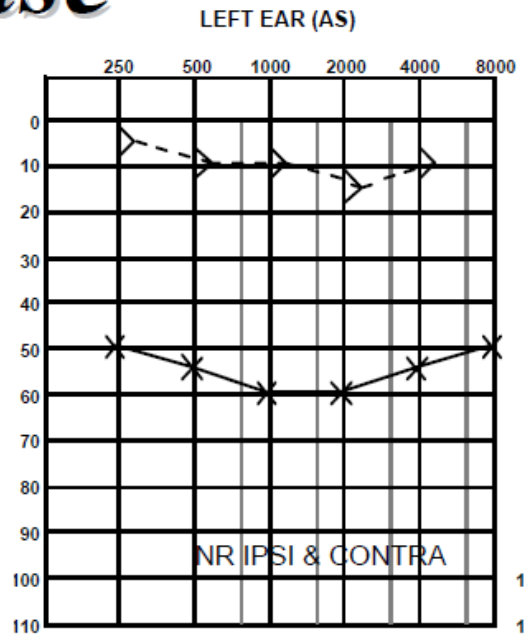
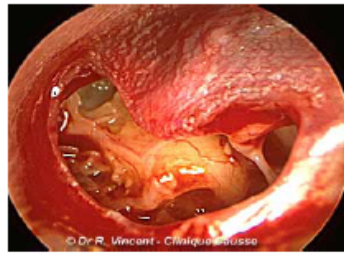
2- Perinatal

- a. Anoxia
- b. Prematurity <1500
- c. Birth injuries >> forceps
- d. Neonatal jaundice > 20% bilirubin
- e. Meningitis
- f. Ototoxic drugs(G) NICU

3- Postnatal (as in adults)**Assessment of hearing in infants and children**

- 1- Evoked response audiometry
  - a. ABR (IMP)
  - b. OAE (IMP)
- 2- Impedance audiometry (stapedial reflex)

# Case



- blood is in the perforated tympanic membrane which indicates acute injury
- the upper line in the graph is bone
- the lower air
- as you can see there is a bone air gap which indicates conductive hearing loss

## Overview of Hearing Loss

- #1 Handicapping disorder
- 60% of Americans > 65 HL
- 90% of > 75 Y have HL
- HL + degenerative processes of aging.
- ½ Vestibular symptoms

## Problems With Diagnosis

- Shame or embarrassment.
- HA social stigma
- Embarrassment prevents 15 million elderly people from getting help.

**Hearing aid:**

- History:
  - 1550 by Girolamo Cardano when he saw that sound could be transmitted through the teeth
- Forms: behind the ear, in the ear, completely in the canal
- Device to amplify sound :
- Consist of
  - Microphone
  - Amplifier
  - receiver

**Cochlear implant:**

- KSA (KAUH) 3<sup>rd</sup> or 4<sup>th</sup> worldwide
- Alexander Volta he took a battery in his ear >> lost consciousness, but before he lost his consciousness he heard a sound and documented it. They reached the point that they can stimulate a nerve >> hear a voice
- Basically it is an electrical device which converts sound to electrical impulses
- Composed of outer microphone and transmitter and internal receiver, electrode which carry stimulation to VIII CN
- Should be done before the school age 5-6 yrs

**BAHA (bone anchored hearing aid)**

- Direct bone conduction bypass the affected part (carries sound directly to cochlea through bone conduction)
- Indicated in bilateral HL, if both outer and inner ears are affected
- Used in conduction and mixed HL , when we cannot perform surgery
- 

**Auditory brainstem implant**

- Respiratory arrest and cardiac arrhythmia are recognized complications

Cases:

- 1- 3 yr old girl came with chronic OM?  
MEE
- 2- RTA , hearing loss , ripped ear, battle sign ?  
Base of the skull fracture
- 3- Pic of tympanosclerosis
- 4- 35 yr old (cholear implant pic)
- 5- BAHA pic (patient)

**-Anything written in black is from lecture slides and the doctor's notes**

**-Anything written in gray is from ENT 427**