



# **SNS COLLEGE OF TECHNOLOGY**

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## **Department of Biomedical Engineering**

Vision Tit 2

Vision Title 3

### **Course Name: 19BMB301 Diagnostic & Therapeutic Equipment**

**III Year : V Semester**

### **Unit 4- Sensory Equipment**

### **Topic : Hearing Aids**



# Definition

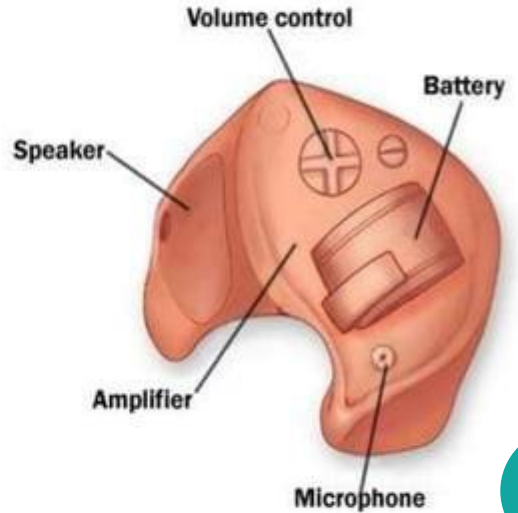
- A hearing aid is an electronic, battery-operated device that amplifies and changes sound to allow for improved communication.





# Components of Hearing Aids

- **Microphone:** Receives sound and converts it into electrical impulses. (picks up sound)
- **Amplifier:** Intensifies electrical impulses. (makes sound louder)
- **Receiver:** Translates those electrical impulses into louder sounds. (delivers amplified sound into ear-miniature loudspeaker)
- **Battery:** Serves as power source for device.
- **Earmolds (earpieces) :** Directs the flow of sound into the ear and enhance sound quality.





# Indication



- Hearing loss



# Types of Hearing Aid

- Pocket Model
- Behind-the-Ear (BTE)
- In-the-Ear (ITE)
- In-the-Canal (ITC), Mini Canal (MIC) and Completely-in-Canal (CIC) aids
- Spectacle type
- Remote microphone (RM)



# Pocket model

- Worn in pocket at chest level.
- A cord transmits the electrical output to a receiver, which converts this signal into





# Behind-the-Ear (BTE)

- BTE hearing aids are worn behind the ear and are connected to a plastic ear mold that fits inside the outer ear.
- The components are held in a case behind the ear. Sound travels from the aid through the ear mold into the ear.







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# In-the-Ear (ITE)



- ITE hearing aids fit completely in the outer ear and are used for mild to severe hearing loss.
- ITE aids can be damaged by earwax and ear drainage, and their small size can cause adjustment problems and feedback.





# In-the-Canal (ITC)

- ITC hearing aids are customized to fit the size and shape of the ear canal and are used for mild or moderately severe hearing loss.
- Small one-piece hearing aid
- All components contained in a custom-fit, hard-molded plastic shell
- Fits outside the ear canal
- Slightly visible in the ear





# Completely-in-Canal (CIC)

- CIC hearing aids are mostly concealed in the ear canal and are used for mild to moderately severe hearing loss.
- Because of their small size, canal aids may be difficult for the user to adjust and remove.
- Canal aids can also be damaged by earwax and ear drainage. They are not recommended for children.
- All components contained in a custom-fit, hard-molded plastic shell







# Spectacle type

- The hearing aid components are incorporated within a spectacle frame.
- It is useful for those who use glasses along with hearing aids.







# Remote microphone

- It combines the advantage of BTE and ITE models.
- This model is virtually invisible.





# Hearing aid problems



- **Whistling Noise**

- Loose ear mold
- Improperly made
- Improperly worn
- Worn out

- **Improper Aid Selection**

- Too much power required in aid
- Separation between microphone and receiver
- Open mold used inappropriately



## • **Inadequate Amplification**

- Dead batteries
- Cerumen in ear
- Cerumen or other material in mold
- Wires or tubing disconnected from aid
- Aid turned off or volume too low
- Improper mold
- Improper aid for degree of loss



## • Pain from Mold

- Improperly fitted mold
- Ear skin or cartilage infection
- Middle ear infection
- Ear tumor
- Unrelated conditions of the temporomandibular joint, throat, or larynx

# Care and maintenance of Hearing Aid



- Prevent it from falling down
- Don't spill liquids on the hearing aid.
- It must fit well.
- Cords should not be twisted or knotted.
- Protect it from dust, dirt and heat.
- Remove the battery from hearing aid when it is not in use.
- Remember to detach the ear mould from the receiver before washing the mould.
- Receiver should not come in contact with the water.

Do not use the hearing aid to medicinal or hair



# IMPLANTED HEARING DEVICES





## Three types

- Cochlear implant
- Bone conduction device
- Semi-implantable hearing device





# 1) Cochlear implants

- A cochlear implant is an auditory prosthesis used for people with profound sensorineural hearing loss bilaterally who do not benefit from conventional hearing aids.



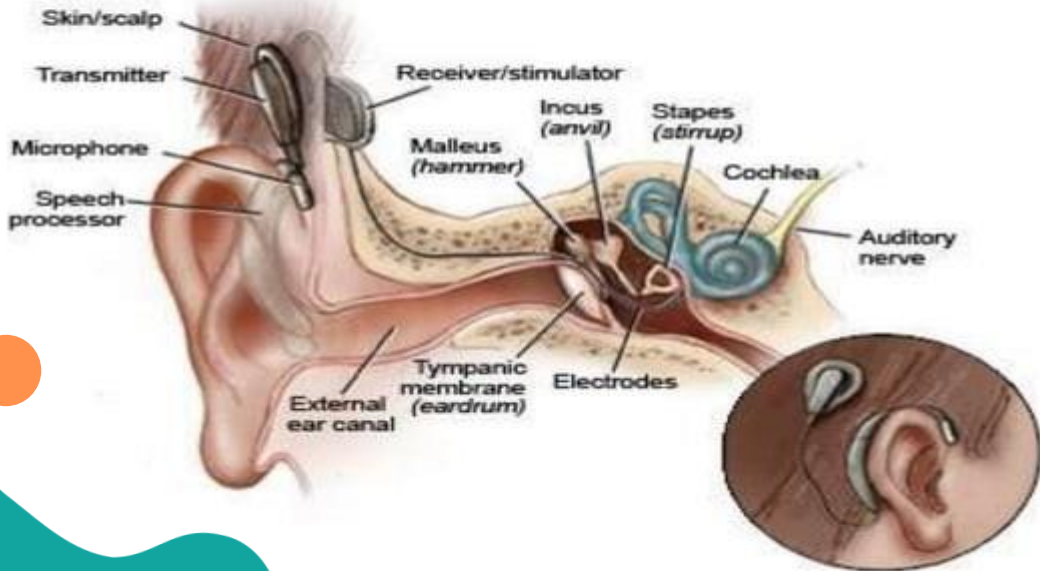
- **Components-** *external*  
*internal*
  - ❖ **External component:** consists of an *external speech processor* and a *transmitter*.
  - ❖ **Internal component:** it is surgically implanted and comprises the *receiver/stimulator* package with an *electrode array*.

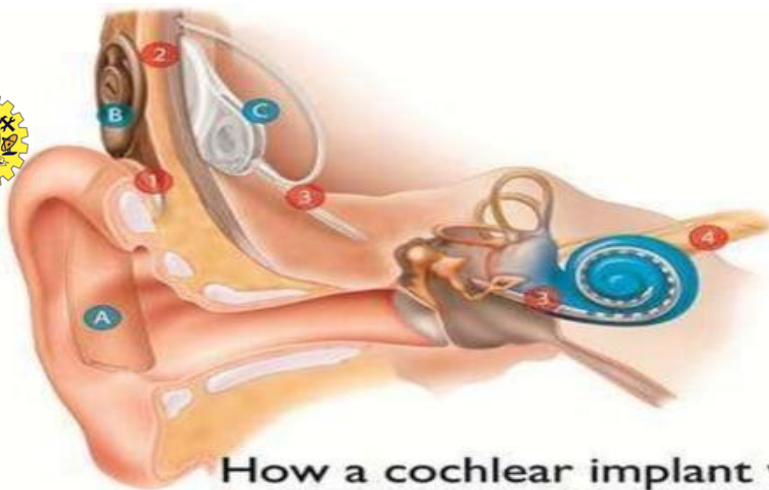


- The implant provides stimulation directly to the auditory nerve, bypassing the nonfunctioning hair cells of the inner ear.
- The microphone and signal processor, worn outside the body, transmit electrical stimuli to the implanted electrodes.
- The electrical signals stimulate the auditory nerve fibers and then the brain, where they are interpreted.



## Cochlear Implant





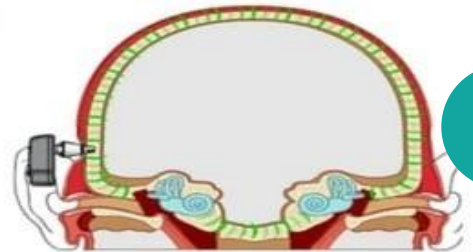
## How a cochlear implant works

1. The sound processor (A) captures sound and converts it into digital code.
2. The sound processor transmits the digitally coded sound through the coil (B) to the implant (C) just under the skin.
3. The implant converts the digitally coded sound to electrical signals and sends them along the electrode array, which is positioned in the cochlea.
4. The implant's electrodes stimulate the cochlea's hearing nerve fibres, which relay the sound signals to the brain to produce hearing sensations.

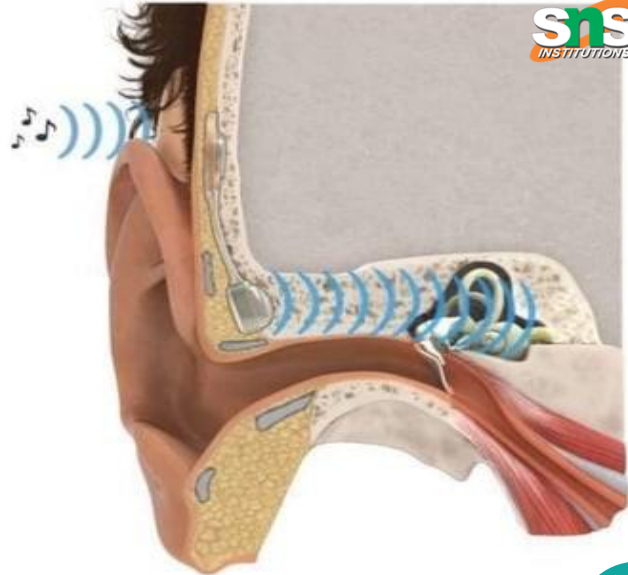


## 2) Bone conduction hearing aid

- Used in patients with a conductive hearing loss if a hearing aid is contraindicated.
- Bone conduction devices transmit sound through the skull to the inner ear.
- The device is implanted postauricularly in the mastoid area under the skin into the skull, an external device, worn above the ear, transmits the sound through the skin









### 3) Semi-implantable hearing device

- The middle ear implantation (MEI) is implanted in the middle ear cavity which mechanically vibrates the middle ear structures.
- MEI is used for sensorineural hearing loss.