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Conductive Hearing Loss in Young Children: Options and Opportunities

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Agenda

1. What is conductive hearing loss?
2. What are the treatment options?
3. What are the pros and cons of each?
4. Parent/child experience sharing



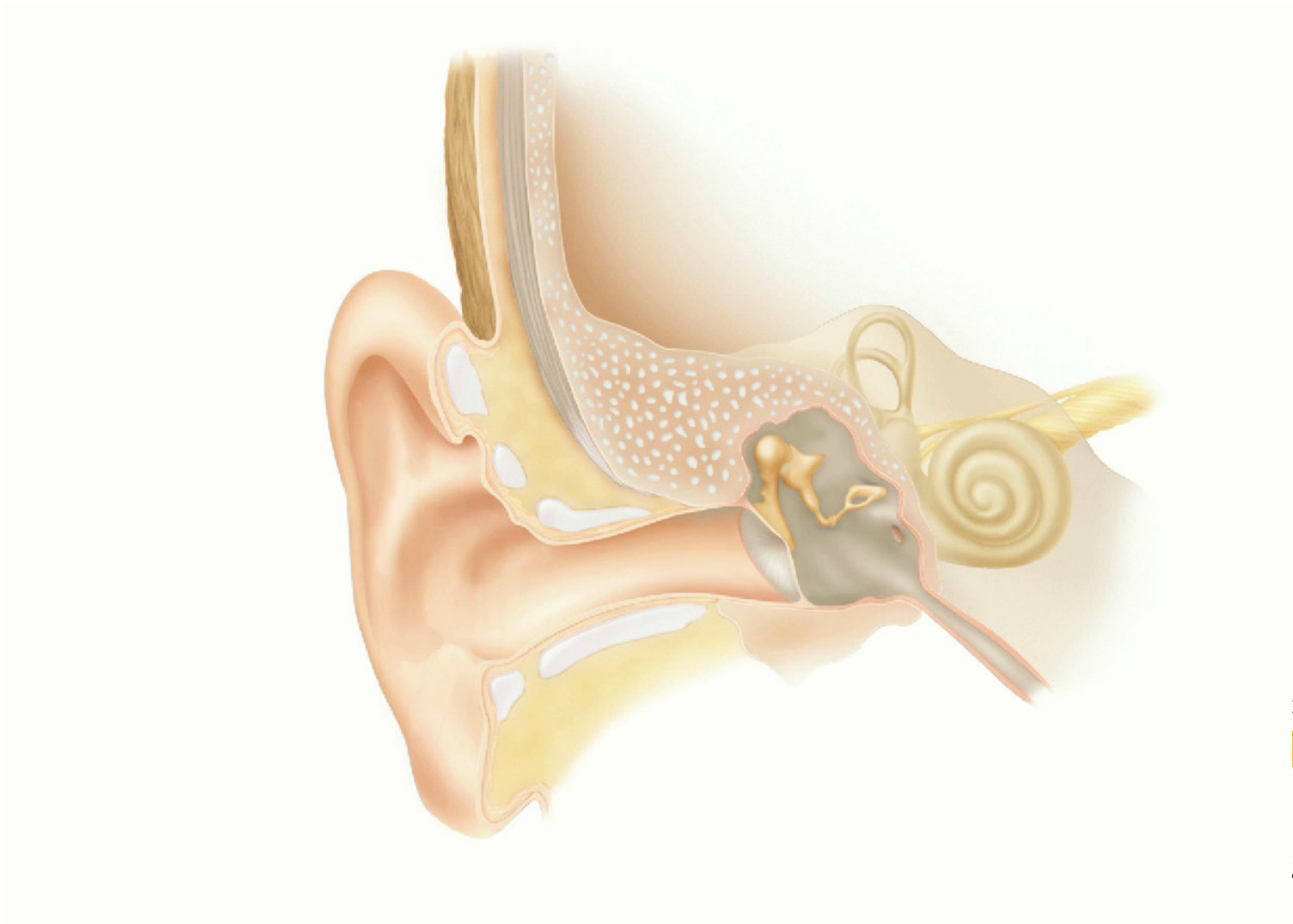
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Major Divisions of the Ear

- Outer Ear (Pinna and Ear Canal)
- Middle Ear (Eardrum, Ossicular Chain)
- Inner Ear (Cochlea)

The Ear



Types of Hearing Loss

- Conductive
- Sensorineural
- Mixed

Conductive Hearing Loss

Something is blocking the transmission of airborne vibration of air particles striking the ear drum (tympanic membrane)

- Wax (cerumen) or other debris
- Malformed or blocked ear canal
- Collapsing ear canal

Conductive Hearing Loss

Something is blocking the transmission of sound through the ear drum or the mechanical vibration of the middle ear bones (ossicles)

- Hole in or damage to eardrum
- Stiffening or dislocation of the bones
- Fluid or tumor (cholesteatoma) in the middle ear

Sensorineural Hearing Loss

The mechanical vibrations are entering the cochlea but the hair cells are damaged and the vibration is not converting correctly to the electrical stimulation the pathway requires.

- Noise induced damage
- Viral insult (Meningitis or CMV)
- Ototoxic agents
- Congenital factors
- Acoustic nerve tumors

Mixed Hearing Loss

Combination of the interruption of vibration energy passing through the outer and middle ear and interruption of function of the hair cells in the inner ear.

- Cholesteatoma with massive destruction and infiltration into the cochlea.
- Congenital malformation of both the middle ear and cochlea
- Damage to the ossicles and temporal bone due to head trauma.

Mixed Hearing Loss

- Application of acoustic amplification for mixed losses must consider both the conductive component (blockage of sound transmission) and damage to hair cells in the cochlea.
- Conductive Loss = 100% compensation
- Sensorineural Loss = 50% compensation
- Most modern fitting formulas are based on these guidelines

Treatment Options Conductive Hearing Loss

- Medical/Surgical: Removal of foreign body, surgical alteration of malformation (canalplasty)
- Myringotomy with vent tubes
- Tympanoplasty
- Mastoidectomy
- Middle ear reconstruction
- Bone anchored hearing (osseointegration)
- Amplification (hearing aid fitting)

Note: Amplification dependent upon condition of outer/middle ear. If infection and/or drainage is present, this may contraindicate use of traditional air conduction hearing aids.

Bone Conduction Amplification

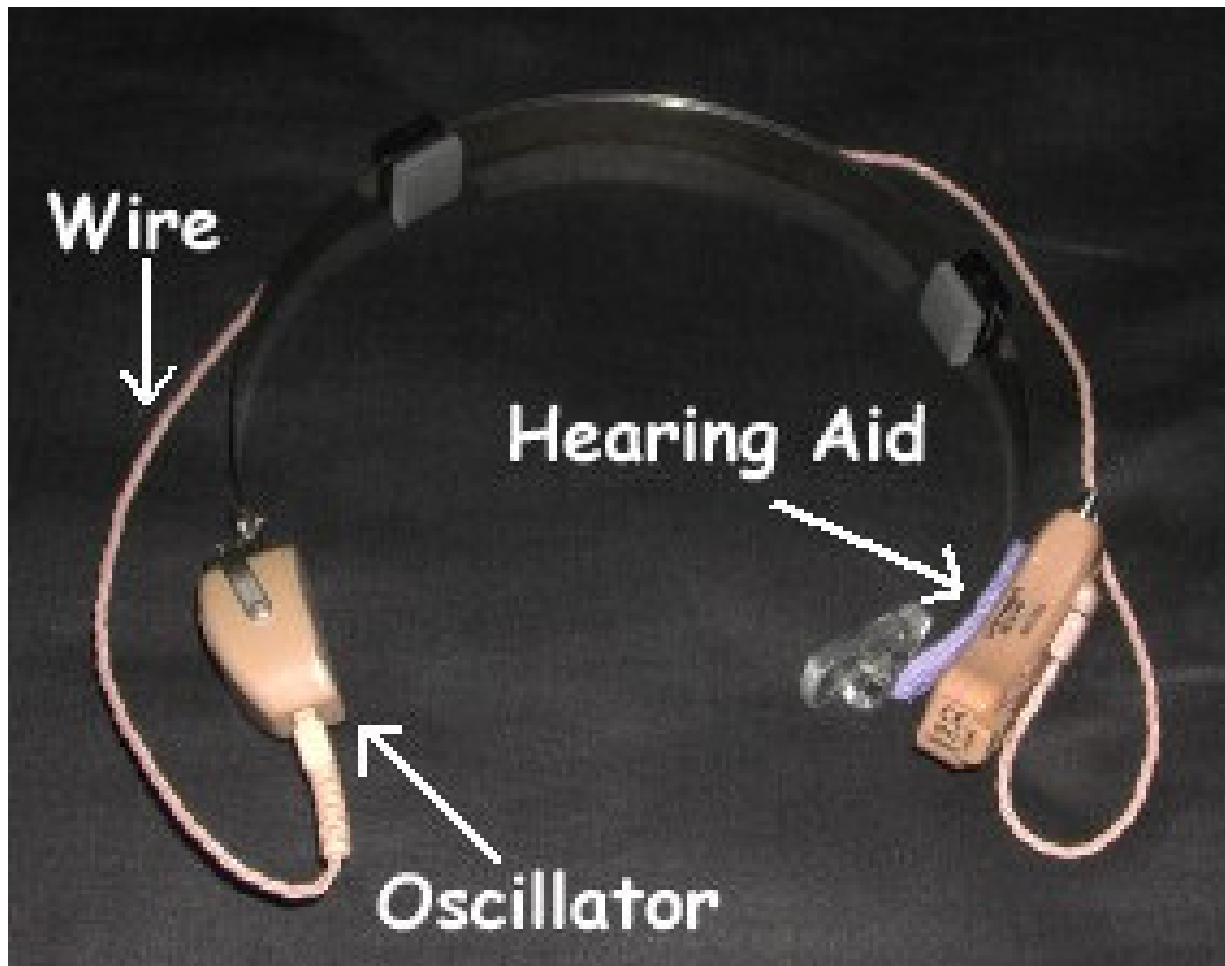


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Traditional Bone Conduction Amplification



Bone Conduction Hearing Aid

- This device is a conventional Air Conduction hearing aid (Power Device) that has been modified to drive a Bone Conduction Oscillator. All of this is mounted to a spring steel band worn on the head. The spring steel band produces sufficient force to allow the vibration from the oscillator to drive the skull.
- Net Result: A VERY tight fit, often resulting in discomfort.

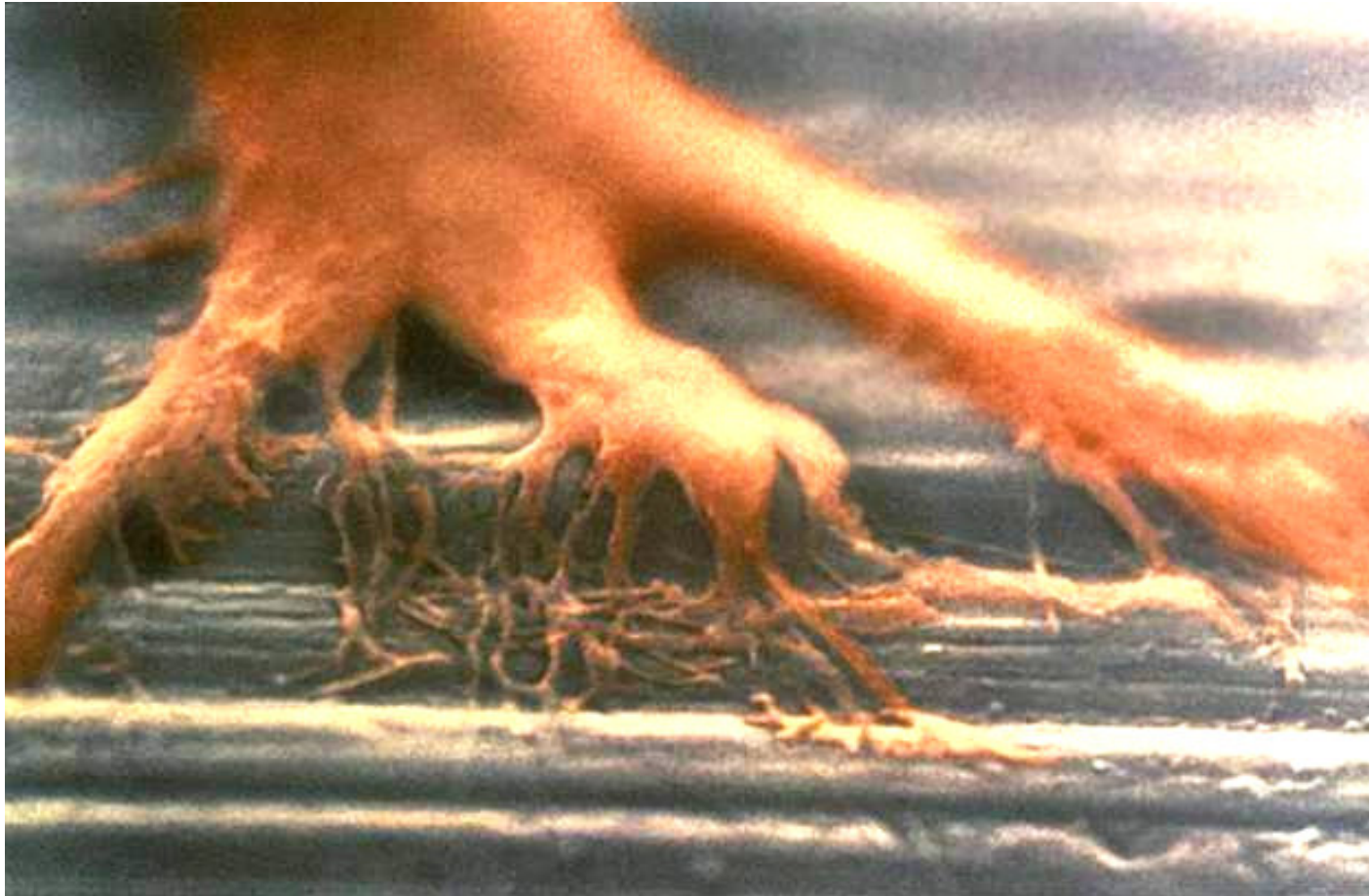
Due to the configuration of traditional Bone Conduction devices, long term compliance with wearing has been a problem.

There is also a loss of vibratory energy because of the soft tissue between the oscillator and the actual skull.

Bone Anchored Hearing

- Due to the work of Branemark and Tjellstrom, the Baha was developed, ushering in the era of Direct Bone Conduction in 1977
- Uses principle of Osseointegration, in which titanium fixture is surgically implanted in the skull with a skin penetrating abutment holding sound processor that attaches externally to the skull

Osseointegration



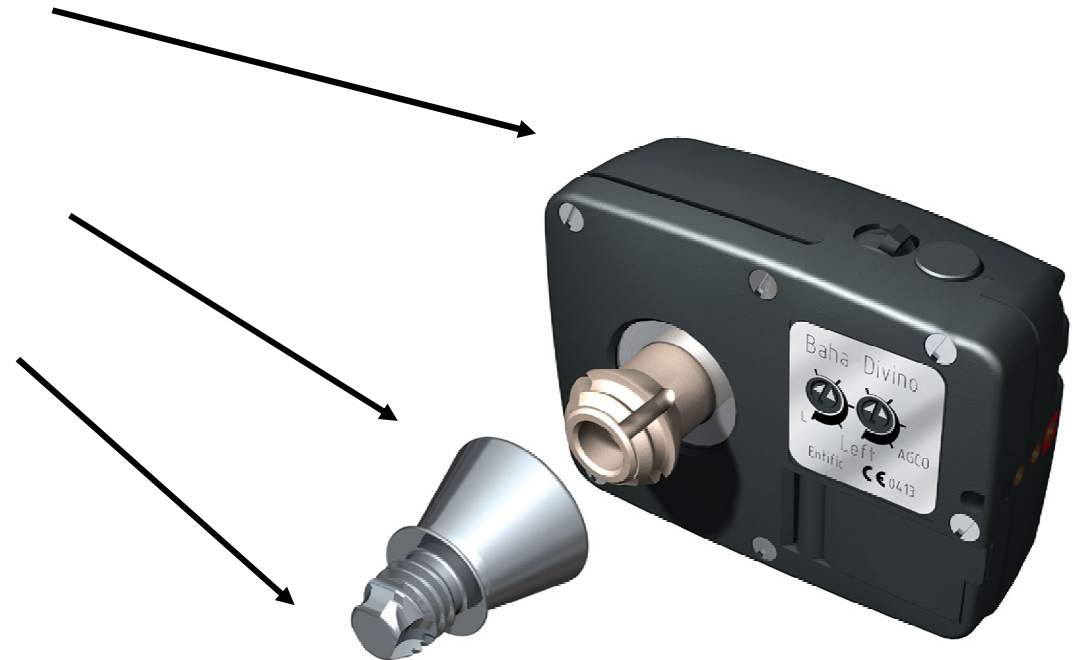
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Parts of the Baha System

Detachable Sound Processor

External Abutment

Titanium implant



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Criteria for Baha

- Since approach requires a surgical procedure, specific criteria for candidacy
- Recipient must be 5 years or older and should have healthy bone.
- Recipient should be able to support good personal hygiene in the maintenance of the abutment site.
- Softband option for children < 5 years

Baha[®] Candidates

- **Age:** 5 years and older but...
 - <5 yrs may use with Softband/headband until old enough for the surgery. Careful supervision needed (small parts hazard)
- **Degree/Type of HL:**
 - Up to moderate-severe bilateral conductive or mixed hearing loss up to 65 dB HL average BC across .5, 1,2,3 Hz
 - Unilateral Sensorineural – specifically for Single-Sided Deafness (SSD) and PTA of AC in normal ear \leq 20 dB across .5,1,2,3 Hz

Softband



Review of Major Hearing Technologies

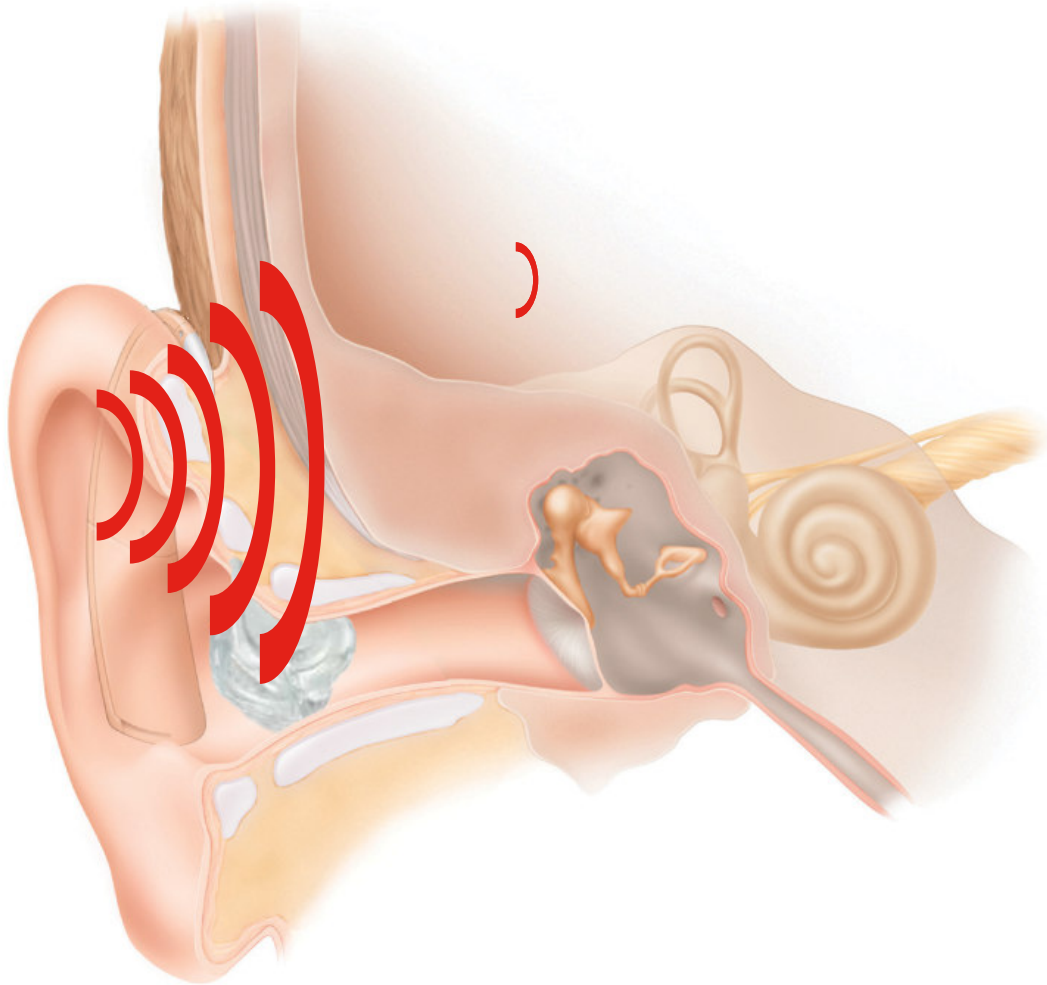


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Hearing aid

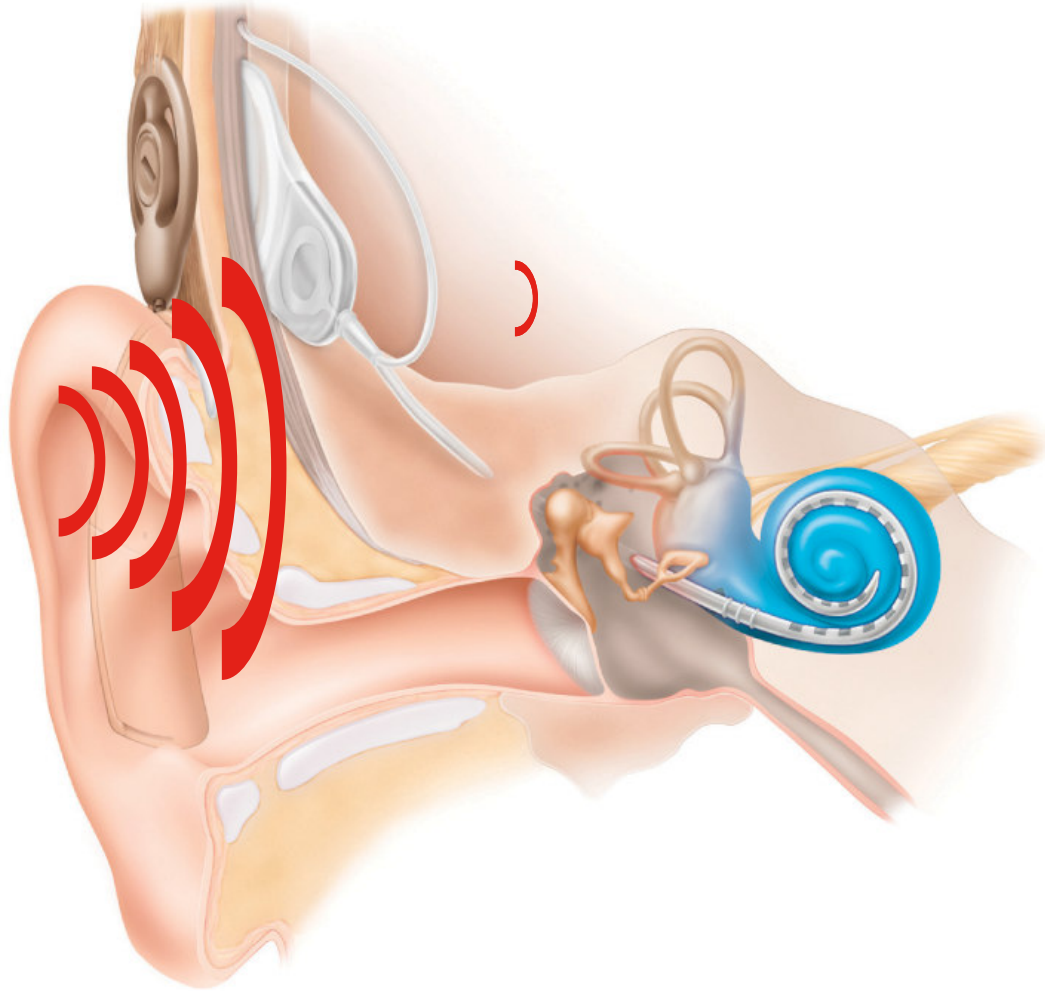


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Cochlear Implant

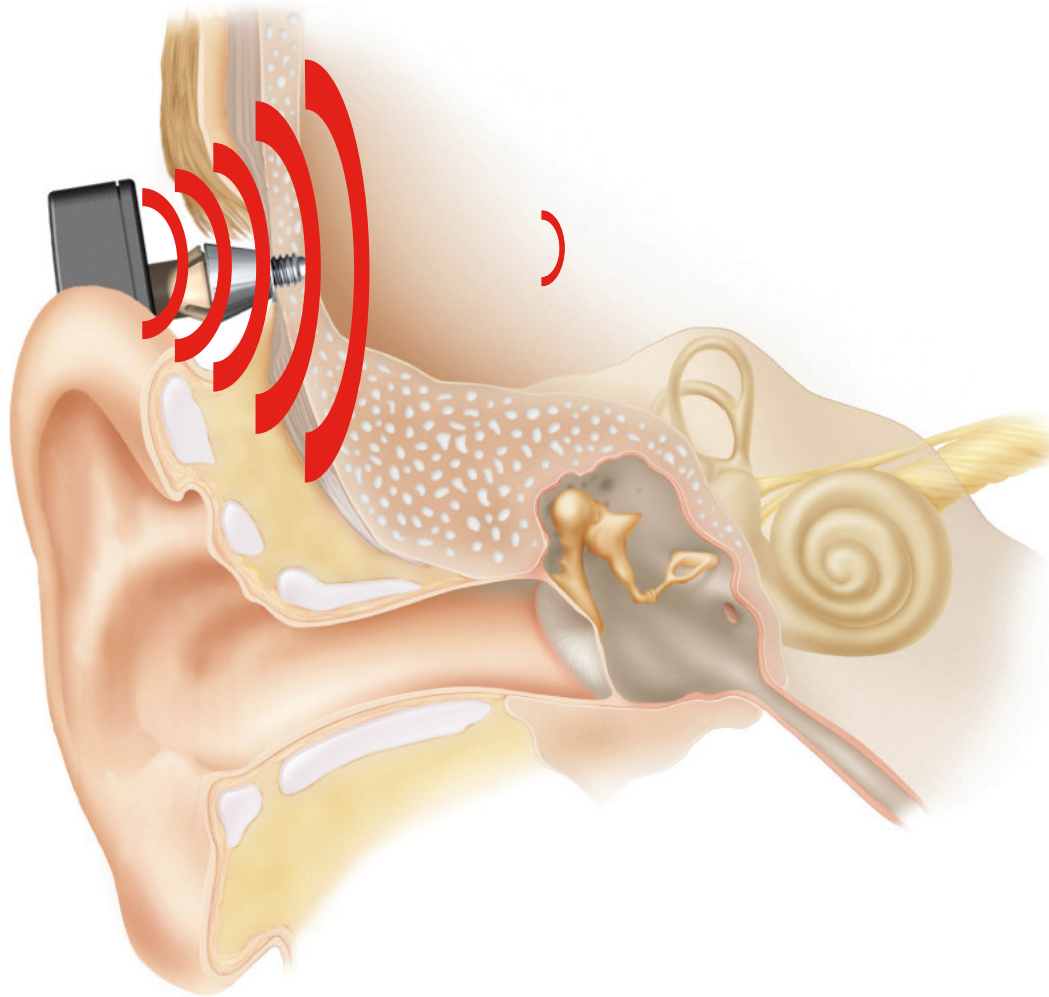


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Baha



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Parent/Child Sharing



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