Hearing Loss in Primary Care

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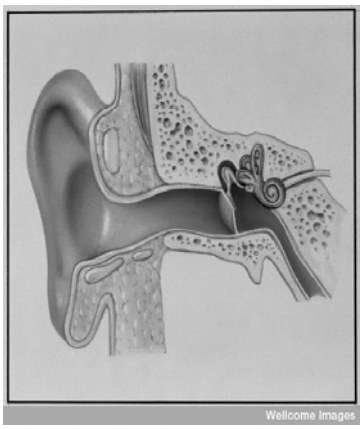
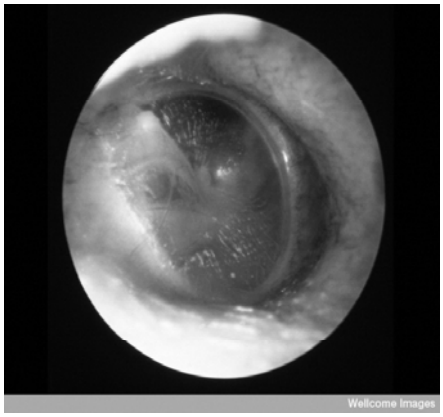
Overview

- Review ear anatomy
- Evaluation of hearing
- Types of hearing loss
- Specific causes of hearing loss

Normal Ear Anatomy





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Evaluation of Hearing

- Bedside Testing
  - Whisper test
  - Tuning forks (512 Hz): Weber and Rinne
- Audiometry
- Electrical Tests
  - ABR: Auditory Brainstem Response
  - Otoacoustic emissions
- Tympanometry

Types of Hearing Loss

- Conductive
  - Loss at level of external ear or middle ear
- Sensorineural
  - Loss at level of inner ear, auditory nerve, or brain
- Mixed
  - Combination of conductive and sensorineural loss

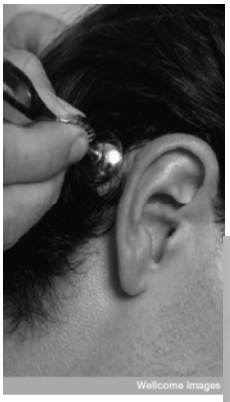
Weber Test

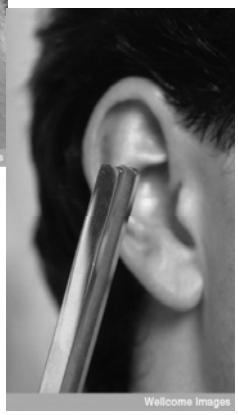
- Tuning fork (512 Hz)
- Forehead bone conduction
- Patient will hear:
  - ON side of conductive loss
  - AWAY from side of sensorineural loss

Image from Wellcome Images

Rinne Test

- Tuning fork (512 Hz)
- Compare bone conduction (mastoid) with air conduction
- Patient will hear:
  - Louder BONE if conductive hearing loss
  - Louder AIR if normal or sensorineural loss





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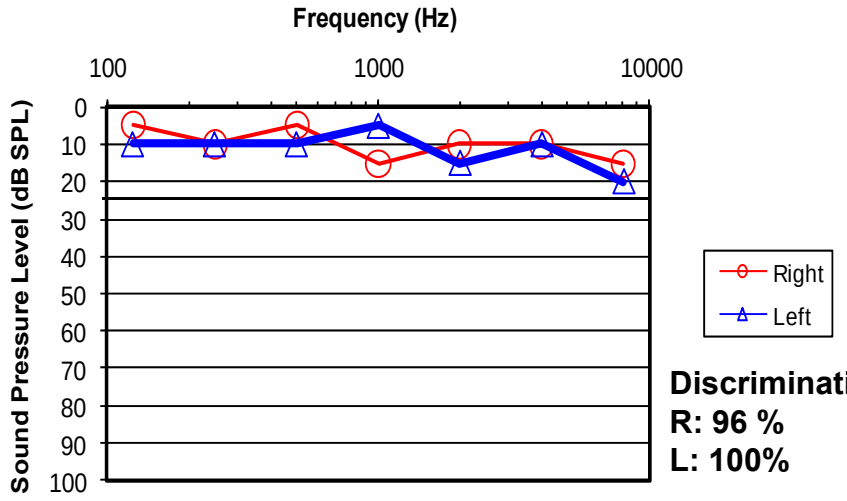
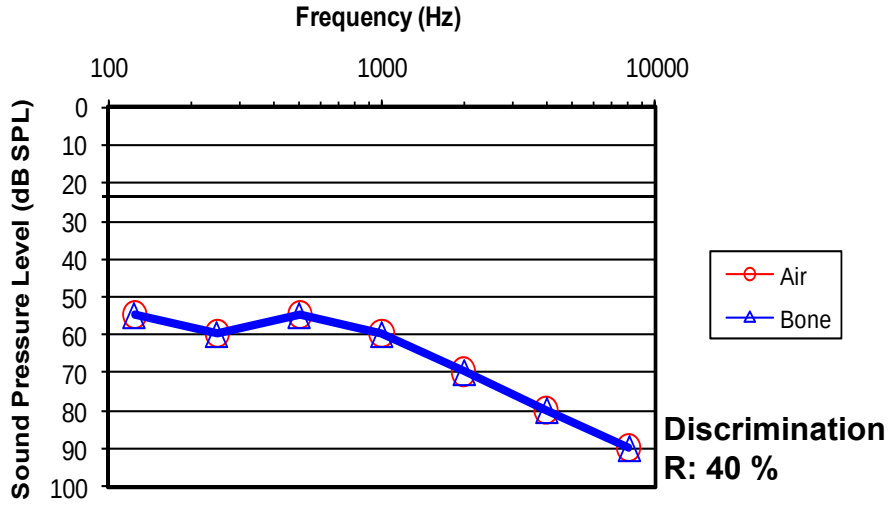
Normal Audiogram



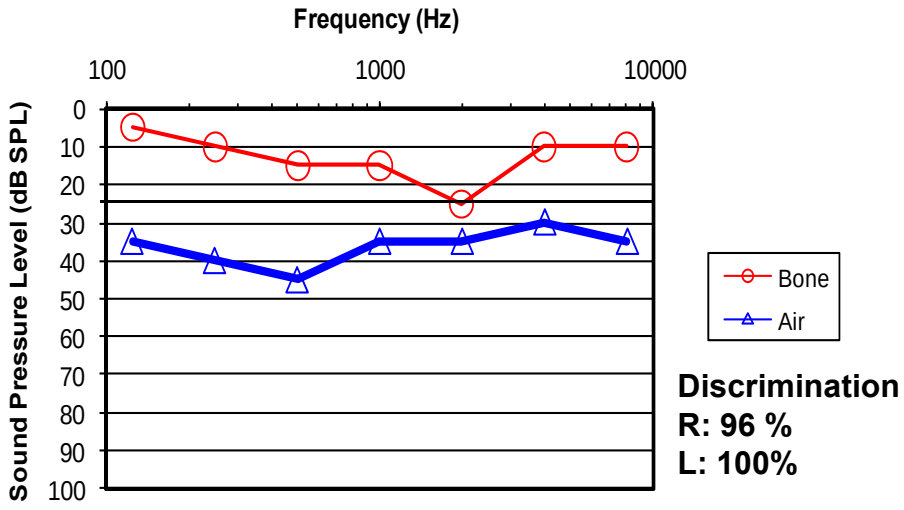
Discrimination:
R: 96 %
L: 100%

Sensorineural Hearing Loss



Discrimination
R: 40 %

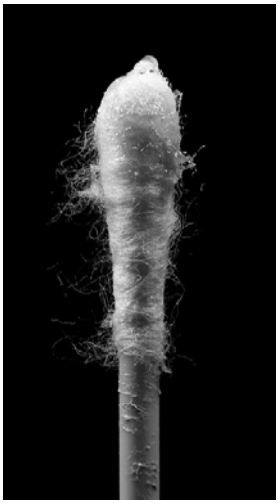
Conductive Hearing Loss



Discrimination
R: 96 %
L: 100%

Causes of Conductive Hearing Loss: External Ear

Cerumen Impaction or Foreign Body



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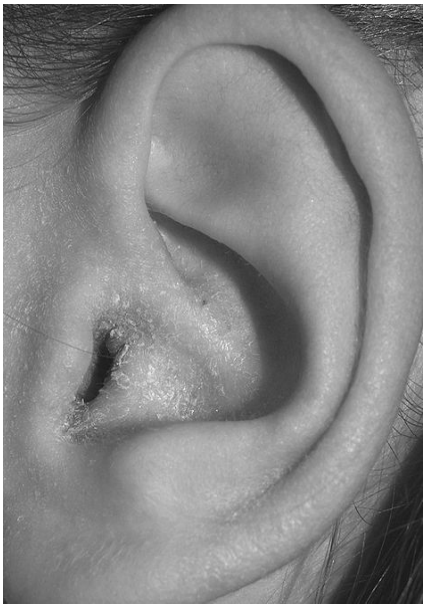
Infectious Disease

- Otitis Externa
- Cellulitis
- Herpes Zoster (Ramsay-Hunt Syndrome)



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Congenital Malformation of External Ear

Microtia/Atresia

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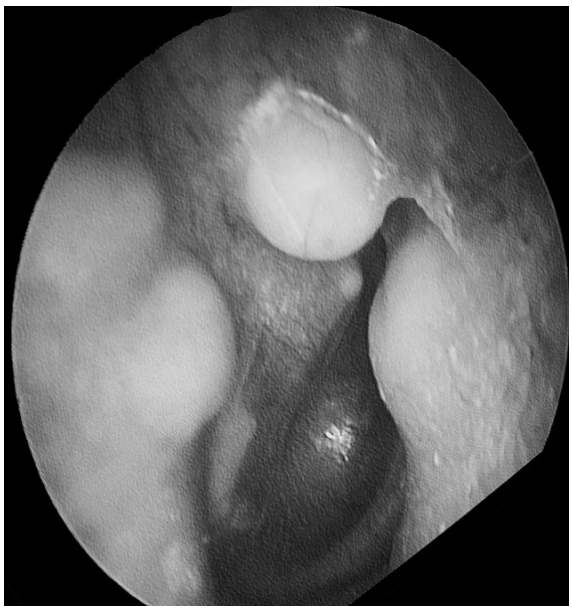
Ear Canal Exostoses



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Carcinoma of the Ear Canal

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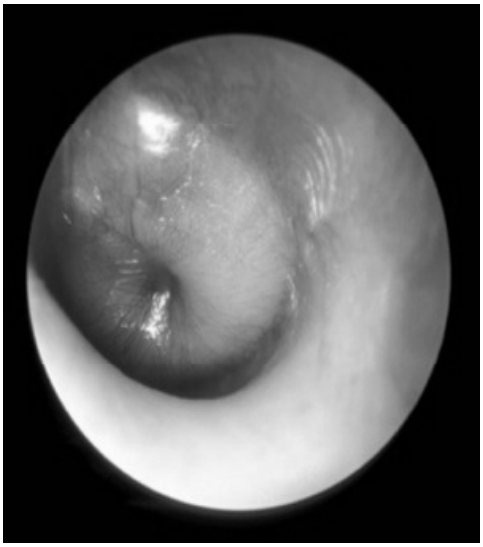
Causes of Conductive Hearing Loss: Middle Ear

Acute Otitis Media



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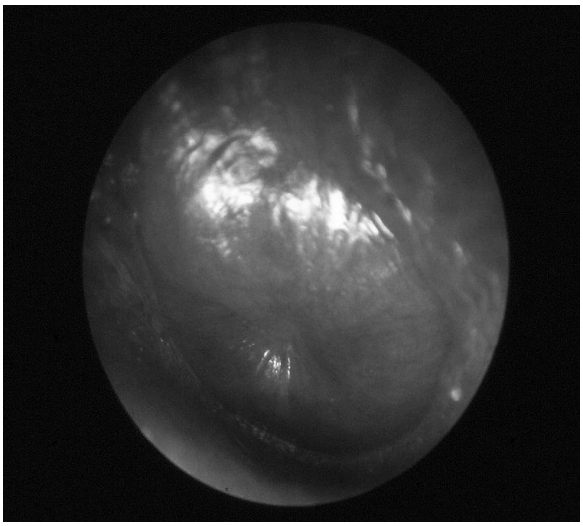
Etiology of Acute Otitis Media

- S. pneumoniae 25%
- H. influenzae 20-25%
- M. catarrhalis 10-20%
- S. pyogenes (gr. A) 2%
- S. aureus 1%
- No growth up to 35%

Beta-lactam resistance is growing in all isolates

Otitis Media with Effusion



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Medical Treatment of OME

- Observation
- Antibiotics
  - Beneficial short-term resolution of OME
  - Unclear long-term impact
- Audiogram at 3 months with persistent effusion
- Follow -up every 6 weeks

Complications of Otitis Media

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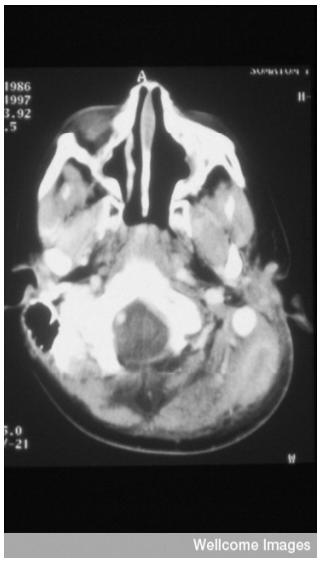

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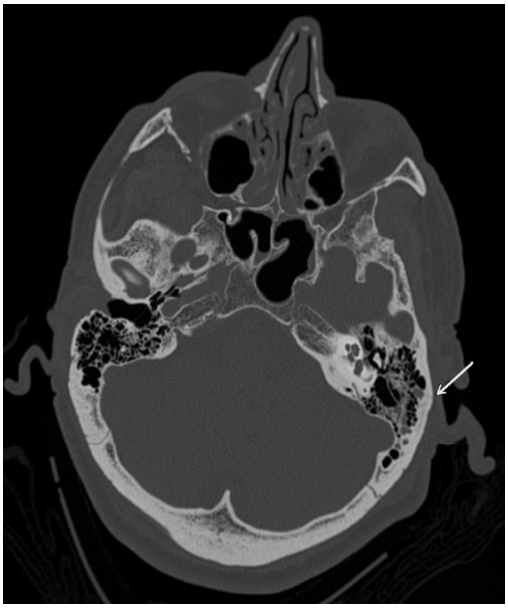
Otitis Media

- When to refer to Oto-HNS?
  - 3 bouts AOM in 6 months
  - 4 bouts AOM in 12 months
  - Chronic OME >3mos, hearing loss, speech delay
  - Complication
  - Earlier if anatomic or immune problem

Hemotympanum



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TM Perforation

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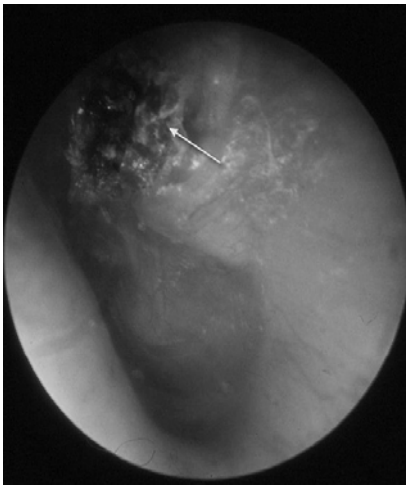
Cholesteatoma



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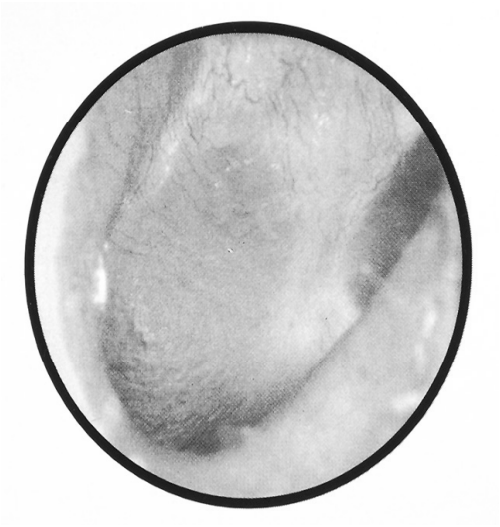
Otosclerosis



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Causes of Sensorineural Hearing Loss: Inner Ear or Auditory Nerve

Presbycusis

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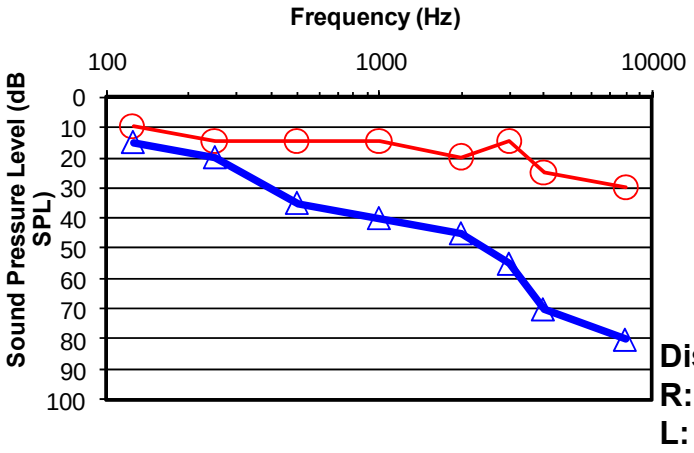
Sudden Sensorineural Hearing Loss



Discrimination:
R: 96 %
L: 72%

Sudden Sensorineural Hearing Loss

Viral? … Vascular? … Autoimmune?

Rule of Thirds

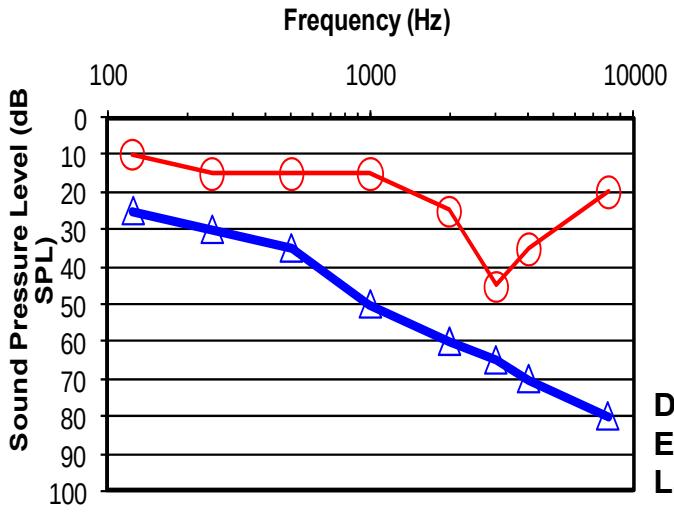
- 1/3 full recovery
- 1/3 partial recovery
- 1/3 permanent hearing loss (15% progressive)
- WITHOUT INTERVENTION

EARLY STEROID THERAPY

Noise Induced Hearing Loss

- Related to intensity, duration, and frequency of noise exposure
- May affect the ears asymmetrically
- Sustained work day (8-hour) exposures >85 dB require the hearing protection and annual audiograms
- Initially affects the 3000-4000 Hz frequency range

Noise Induced Loss



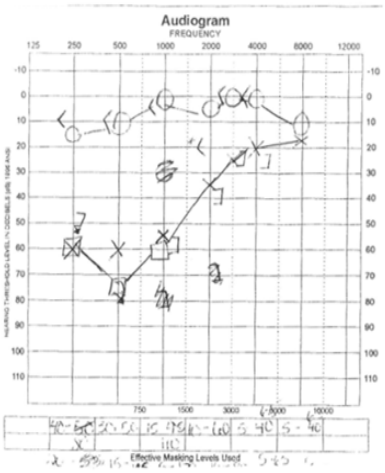
Discrimination:
Early: 96 %
Later: 72%

Vestibular Neuronitis/Labyrinthitis

- **Put simply, "an inner ear infection"**
- **Usually viral. Treated symptomatically. Steroids may help. Antibiotics not usually required. May takes weeks to resolve.**
- **Labyrinthitis causes hearing loss and vertigo. Hearing loss can be permanent.**

Meniere's Disease

- Episodic vertigo, tinnitus, aural fullness & hearing loss
- Treatment: low salt diet, thiazide diuretics and PRN vestibular suppressants.
- Other interventions: transtympanic gentamicin/steroid injection, endolymphatic shunt surgery, labyrinthectomy, or vestibular nerve section
- Up to 30% bilateral



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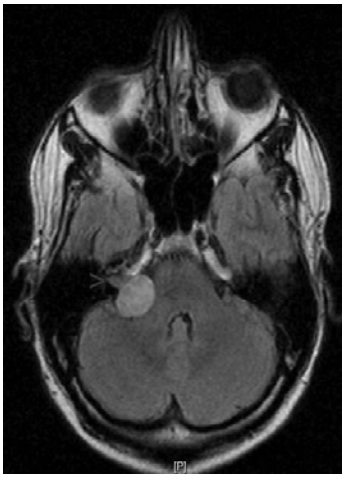
Acoustic Neuroma/Vestibular Schwannoma

- 8th cranial nerve
- Hearing loss, tinnitus, & disequilibrium early
- Facial numbness, facial weakness, hydrocephalus late
- 5% are associated with Type II Neurofibromatosis
- Tx: Surgery, gamma knife, observation

T1 post-contrast MRI



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Summary

- Review ear anatomy
- Evaluation of hearing
- Types of hearing loss
- Specific causes of hearing loss

Hearing Loss for Primary Care Physicians

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614-293-8065 614-293-6179 fax

915 Olentangy River Road, 4th Floor, Columbus, OH 43212

565 Metro Place South, Suite 400, Dublin, OH 43017

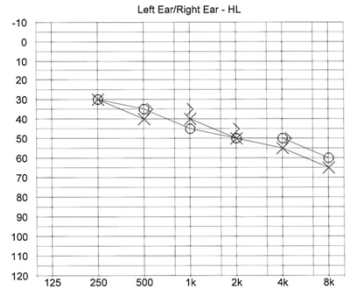
5175 Morse Road, Suite 100, Gahanna, OH 43230

Audiological Evaluation

Client Name:

Birth Date:

Session Date:



Audiologist: _____

Attending Physician:_____

Headphones/Inserts/Soundfield

Test/Retest: Good Fair Poor

Validity: Acceptable Questionable

Air - HTL Right: ○ △

Air - HTL Left: × □

Bone - HTL Left: 〉 ⊐

	Right			Left		
PTA (A):	43 dB			43 dB		
	Right	Masking		Left	Masking	
SRT:	40 dB			SRT: 40 dB		

Unaided Recognition Score:

Right	Level	Masking	Binaural	Level	Masking	Left	Level	Masking
88 %	75 dB	45 dB				84 %	75 dB	45 dB

Aided Recognition Score:

Right	Level	Masking	Binaural	Level	Masking	Left	Level	Masking

Notes

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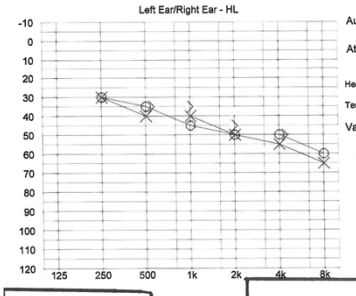

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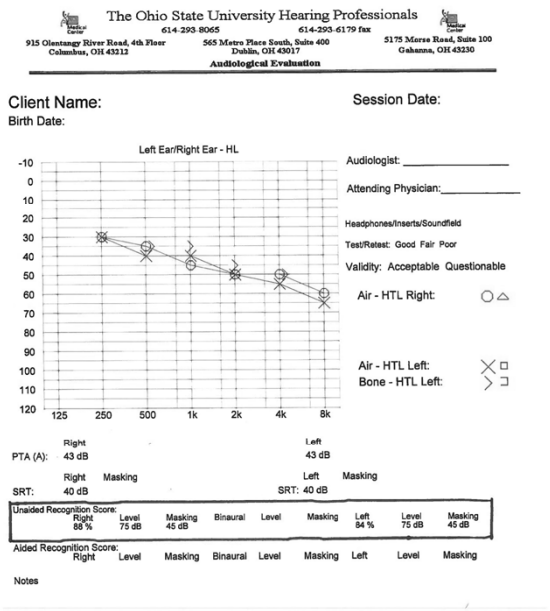
Notes



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Audiological Evaluation

Client Name:

Birth Date:

Session Date:

Left Ear/Right Ear - HL

-10 0 10 20 30 40 50 60 70 80 90 100 110 120

125 250 500 1k 2k 4k 8k

Audiologist: _____

Attending Physician: _____

Headphones/Inserts/Soundfield

Test/Retest: Good Fair Poor

Validity: Acceptable Questionable

Air - HTL Right:

Air - HTL Left:

Bone - HTL Left:

	Right			Left		
PTA (A):	43 dB			43 dB		
	Right	Masking		Left	Masking	
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Unaided Recognition Score:								
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88 %	75 dB	45 dB				84 %	75 dB	45 dB

Aided Recognition Score:								
Right	Level	Masking	Binaural	Level	Masking	Left	Level	Masking

Notes

Medical Clearance

- **Medical Clearance is required prior to a patient being fit with hearing aids.**
- **Medical Clearance may be obtained 3 ways**
  - **Evaluation by an ENT/Otologist**
  - **Evaluation by PCP, provided results do not warrant referral to an ENT**
  - **Patient Medical Waiver**

What to look for when giving medical clearance for amplification

- Asymmetrical air conduction thresholds
- Conductive component of hearing loss
  - 'air-bone gap'
- Asymmetrical speech discrimination
- Chronic middle ear disease

Hearing Aids : Factors to consider

- Age of patient
- Dexterity
- Severity/configuration of hearing loss
- Cosmetics
- Battery life
- Anatomy of the patient's ear

Styles of Hearing Aids

Completely-In-The Canal (CIC)

In-The-Canal (ITC)

In-The-Ear (ITE)

Behind-The-Ear (BTE)

Photos courtesy of Phonak

'Open Fitting' Hearing Aids

- Appropriate for hearing loss that is normal/mild in the low frequencies.
- Inappropriate if much gain is needed at 250-500Hz
  - Can be coupled to an earmold, however to give low frequency gain
- Designed to eliminate the occlusion effect and improve cosmetics

Photos courtesy of Phonak

Newer Features in Hearing Aids

- In some advanced level products the following features are now available:
  - Wireless connectivity between ears
  - Automatic program changes
  - Better feedback control
  - Adaptive directionality
  - Wireless connectivity to bluetooth devices

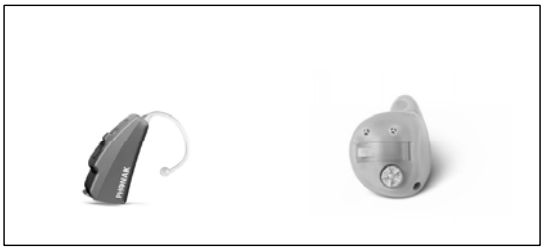
Bluetooth compatibility

- Some hearing aids now have capability to connect with bluetooth devices
- Phone compatibility

- TV compatibility

Photos courtesy of Phonak

CROS/BICROS amplification



- For use when one ear is not aidable
- Transmitter on the poorer hearing ear
- Receiver and hearing aid on the better hearing ear
- Wireless communication

Photos courtesy of Phonak

FM System

- Transmitter

- Receiver

- Options for CI/BAHA

Photos courtesy of Phonak and Cochlear Americas

When hearing aids are not enough

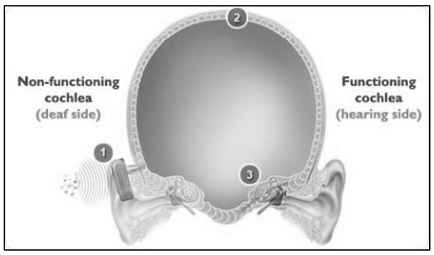
- Cochlear implants and bone anchored hearing solutions are options for patients who cannot benefit from traditional amplification

- What are bone anchored hearing solutions?
  - Bone anchored hearing solutions are surgically implanted devices that transmit sound via bone conduction bypassing the middle ear to a normally hearing cochlea (either ipsi or contralaterally).
  - Often referred to as BAHA
  - Implications for single sided deafness and conductive/mixed hearing losses that cannot be conventionally amplified.

BAHA Candidacy

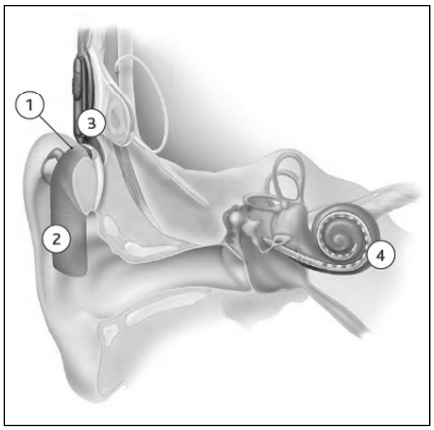
- **Single Sided Deafness**
  - **Poorer ear- Profound SNHL**
  - **Good Ear- PTA AC threshold ≤20dB @ 500, 1000, 2000, and 3000Hz**
- **Mixed/Conductive**
  - **PTA BC threshold ≤65dBHL @500, 1000, 2000, 3000Hz.**

BAHA



Photos courtesy of Cochlear Americas

Cochlear Implant



- Consists of an external speech processor and a surgically implanted device
- Electrode implanted in the cochlea to electrically stimulate the nerve

Photos courtesy of Cochlear Americas

Cochlear Implant Candidacy- Children

- Profound sensorineural hearing loss bilaterally
  - Age 12-24 months
- Severe to profound sensorineural hearing loss
  - Age 2-17 years
- Limited benefit from binaural amplification trial

Cochlear Implant Candidacy- Adults

- Moderate to profound sensorineural hearing loss bilaterally
- Limited benefit from amplification defined by preoperative sentence recognition scores

Watch out for:

- Cochlear Implant Patients
  - Redness at magnet site
- Hearing Aid Patients
  - Otitis Externa caused by earmold closing off ear canal
- BAHA
  - Skin overgrowth at abutment site
- Patients who have hearing concerns