Hearing Loss in Primary Care

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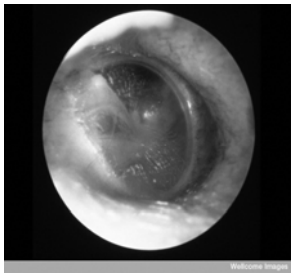
Overview

- 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

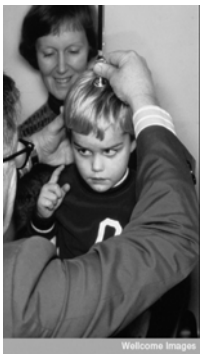
- Bedside Testing
  - Whisper test
  - Tuning forks (512 Hz): Weber and Rinne
- Audiometry
- Electrical Tests
  - ABR: Auditory Brainstem Response
  - Otoacoustic emissions
- Tympanometry

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



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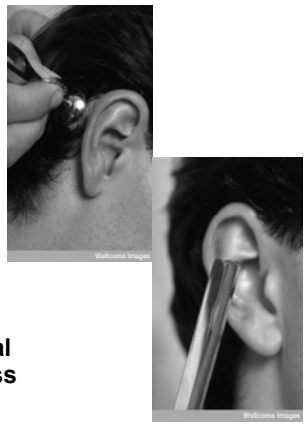
Rinne Test

- 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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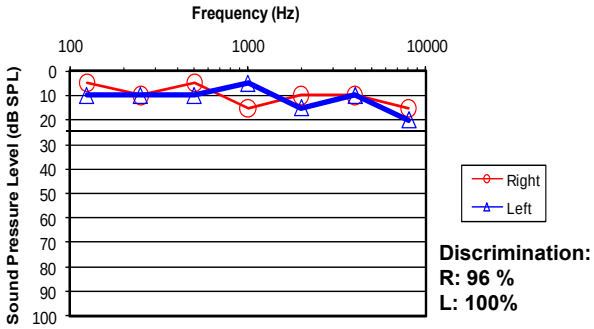
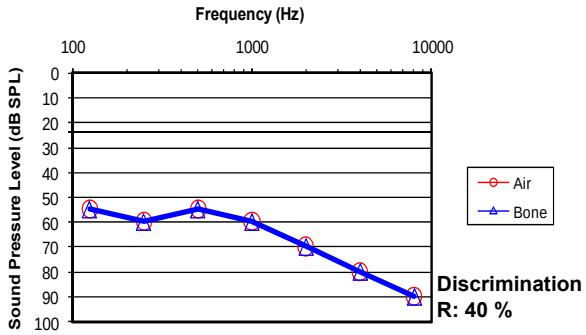
Normal Audiogram



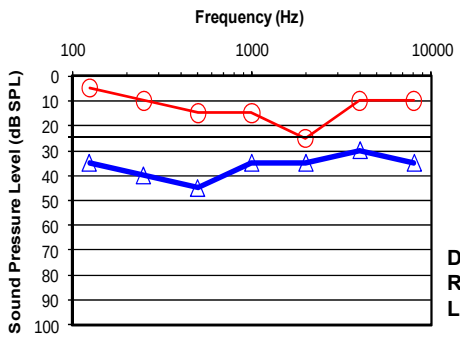
Discrimination:
R: 96 %
L: 100%

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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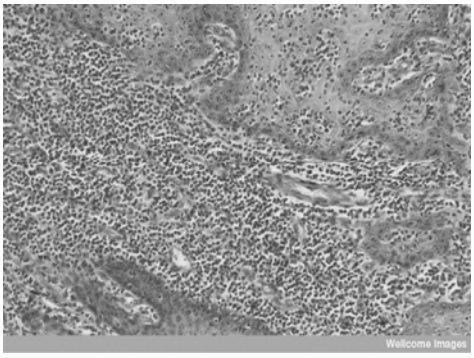
Carcinoma of the Ear Canal



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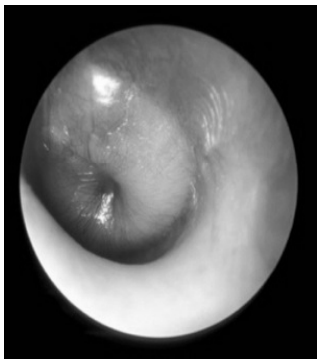
Causes of Conductive Hearing Loss: Middle Ear

Acute Otitis Media



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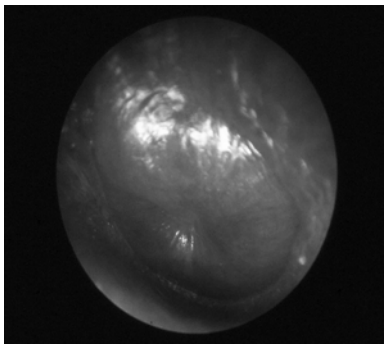
Etiology of Acute Otitis Media

- 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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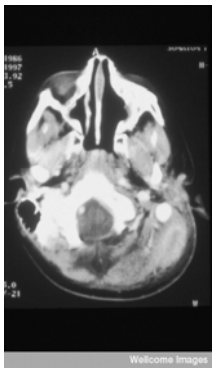

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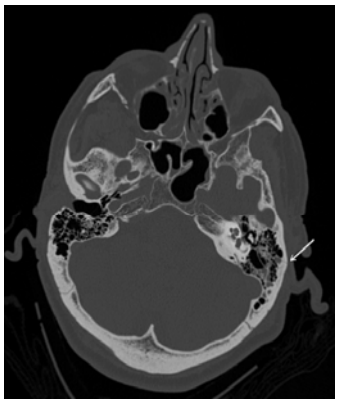
Otitis Media

- 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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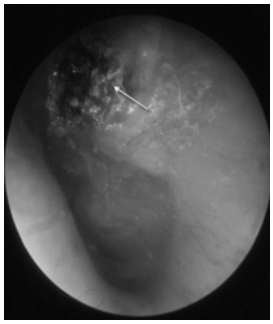
Cholesteatoma



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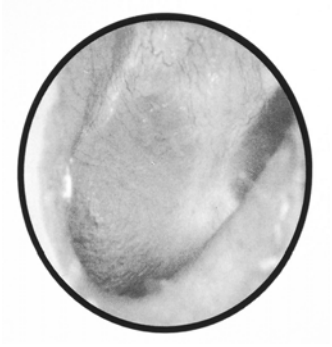
Otosclerosis



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Causes of Sensorineural Hearing Loss: Inner Ear or Auditory Nerve

Presbycusis

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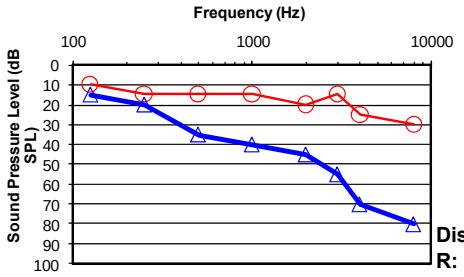
Sudden Sensorineural Hearing Loss



Discrimination:
R: 96 %
L: 72%

Sudden Sensorineural Hearing Loss

Viral? … Vascular? … Autoimmune?

Rule of Thirds

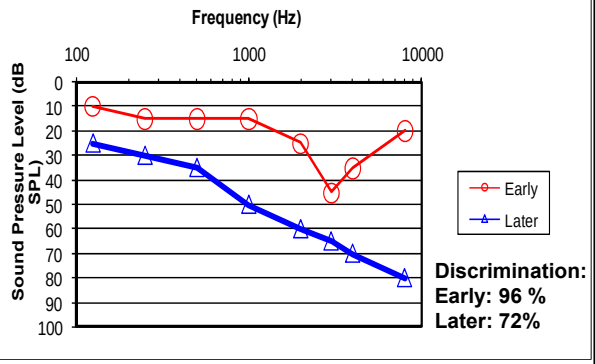
- 1/3 full recovery
- 1/3 partial recovery
- 1/3 permanent hearing loss (15% progressive)
- WITHOUT INTERVENTION

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



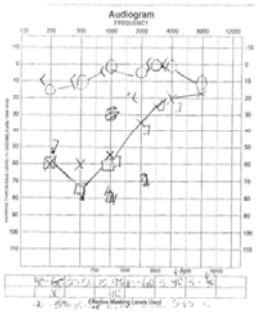
Discrimination:
Early: 96 %
Later: 72%

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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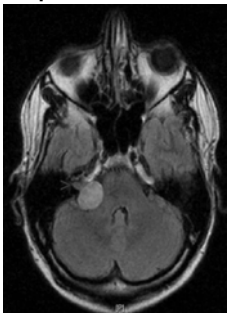
Acoustic Neuroma/Vestibular Schwannoma

- **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

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- Evaluation of hearing
- Types of hearing loss
- Specific causes of hearing loss

Hearing Loss for Primary Care Physicians

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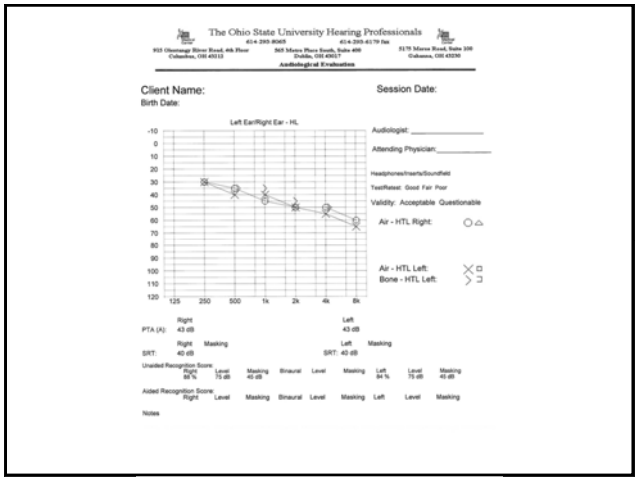

The Ohio State University Hearing Professionals

Audiological Evaluation

Client Name: Session Date:

Birth Date:

Left Ear/Right Ear - HL

Audiologist: _____

Attending Physician: _____

Headphones/Inserts/Soundfield

Test/Retest: Good Fair Poor

Validity: Acceptable Questionable

Air - HTL Right:

Air - HTL Left:

Bone - HTL Left:

125 250 500 1k 2k 4k 8k

Right Left

PTA (A): 43 dB 43 dB

Right Masking Left Masking

SRT: 40 dB SRT: 40 dB

Unaided Recognition Score:

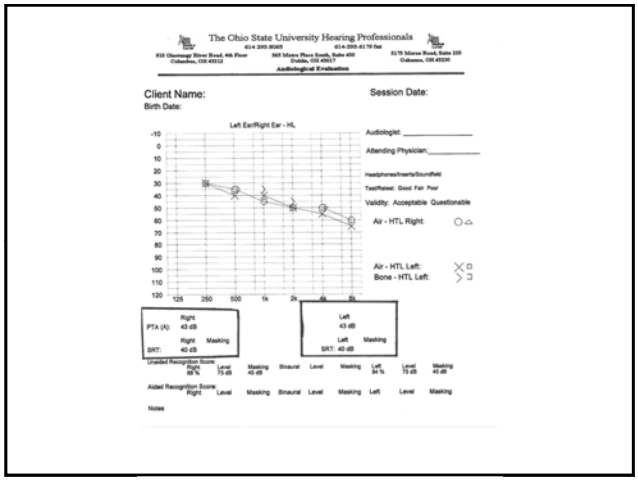
Right Level Masking Binaural Level Masking Left Level Masking

88 % 75 dB 40 dB 84 % 75 dB 40 dB

Aided Recognition Score:

Right Level Masking Binaural Level Masking Left Level Masking

Notes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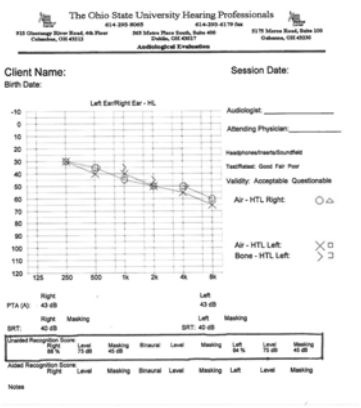
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Headphones/Inserts/Soundfield

Test/Retest: Good Fair Poor

Validity: Acceptable Questionable

Air - HTL Right:

Air - HTL Left:

Bone - HTL Left:

125 250 500 1k 2k 4k 8k

PTA (A): Right 43 dB Left 43 dB

SRT: Right 40 dB Masking Left SRT: 40 dB Masking

Unaided Recognition Score: Right 88 % Level 75 dB Masking 40 dB Binaural Level Masking Left 94 % Level 75 dB Masking 40 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

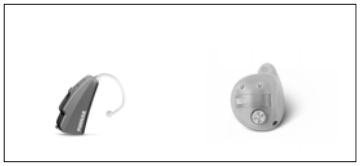
Bluetooth compatibility

- 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

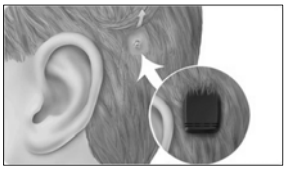
- Cochlear implants and bone anchored hearing solutions are options for patients who cannot benefit from traditional amplification

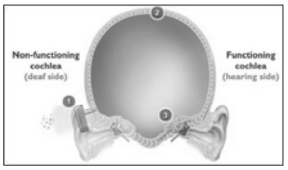
- What are bone anchored hearing solutions?
  - Bone anchored hearing solutions are surgically implanted devices that transmit sound via bone conduction bypassing the middle ear to a normally hearing cochlea (either ipsi or contralaterally).
  - Often referred to as BAHA
  - Implications for single sided 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.

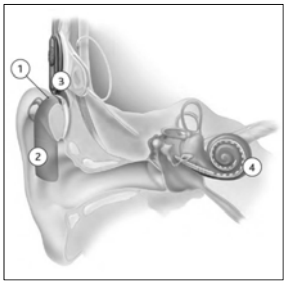
BAHA





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