HEARING AID ACADEMY

2022 STUDENT MANUAL

BOOK #2

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Chapter 14: BTE Earmolds & Couplers

Chapter #14

BTE Earmolds & Couplers

Basic Tasks

1. Your focus in this lesson is limited to custom in-the-ear fittings and BTE fittings with custom ear molds.
2. They are called couplers because the molds couple the hearing instrument to the wearer, just as the 2cc coupler couples the hearing instrument to the test equipment.
3. When you are in practice, you will quickly learn two very important facts about ear molds, shells, and receiver molds.

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They are

- You will receive ample assistance from two sources: (1) your manufacturer's technical support staff in reference to custom instrument shells; and, (2) your earmold laboratory.
- Earmold video training

General Criteria

- Receiver Mold for Body Aid
  - Profound HL
  - Check for allergies to medical plastics
  - Venting not usually an issue
  - Mold generally taken well beyond second turn of canal

General Criteria for Custom Aids

- Hooks in and around pinna (potential limiting factor)
- Manual dexterity of user – be aware of arthritis, fingertip sensitivity, manipulability
- HL
- Ear canal tortuosity
- Ear canal volume
- Second bend
- Desires of the Pt

Venting, Tubing, & Occlusion

- Venting is a very important aspect of any mold.
  - Type of Loss
  - Occlusion?
- Tubing
  - No one but you will know how to point the tubing directly at the TM – Don't forget this.
  - Occlusion?

Venting

- Purpose: To allow air into the ear canal to equalize pressure; and, to allow non-augmented (non-amplified) sound waves to pass through and meet amplified waves where after they strike the TM.
- Types: Parallel, Diagonal, and External
- The more natural acuity, the larger the vent requirement. The less the acuity, the smaller the vent necessity.

Venting

- Severe to profound losses generally require nothing more than a pressure equalizing vent, if that.
- Generally, the size of the vent is factored into the size of the face plate, with anatomical configurations factoring into the potential for venting.

RICs

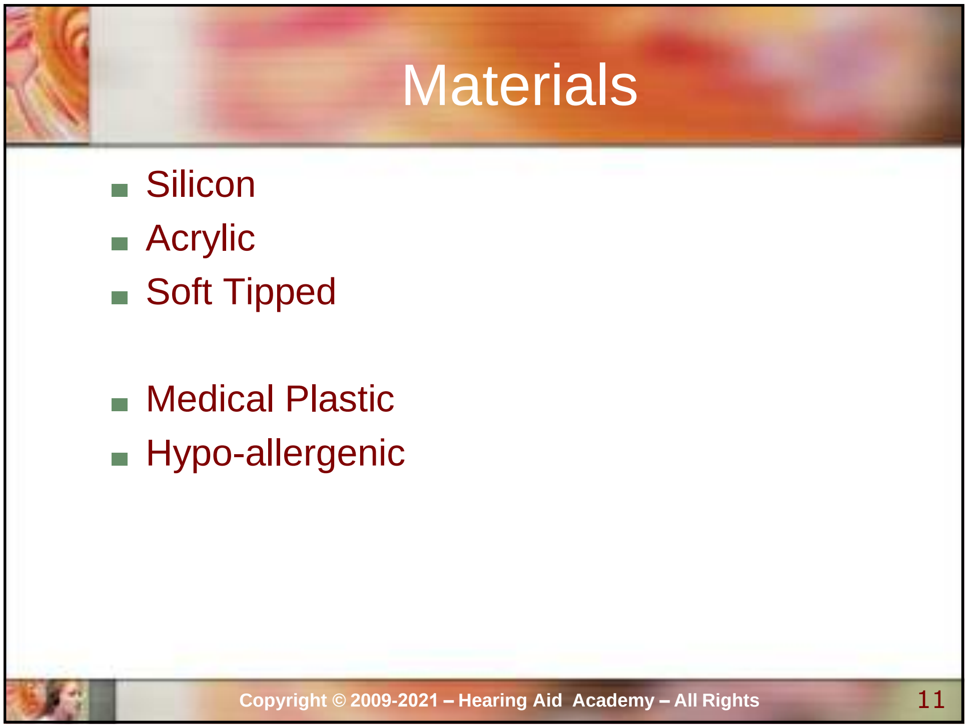
- One of the most popular developments in technology is the Receiver In Canal which adds a very old technology with new. As with the body aid, the receiver is at or in the ear canal. With the RIC, the receiver fits well into the canal if sized properly.

- These instruments require that you size and fit the receiver domes and tubing with accuracy.

Types of Molds

Receiver, Full shell,

Skeleton, Non-occlusive/Open molds



Guest Video Lecture for Chapter 14 is by Edward Lybarger of Pittsburg, PA

Mr. Edward Lybarger served on the Pennsylvania Hearing Instrument Specialist Board of Directors for 20 years and operated a successful Hearing Aid Office in the Pittsburg, PA area.

His Father Sam Lybarger was the Electrical Engineer for Radioear Corporation in McMurry, PA until his retirement and his work on Ear mold Acoustics is referenced in most Audiology textbooks even today.

It was my pleasure to have known Sam Lybarger and I have been a friend of Edward Lybarger since we were both young men. It was my pleasure. Dennis L. Gunn

Chapter 15:
Programming & Troubleshooting

Chapter #15

Programming & Troubleshooting

Criteria for Adequate Programming

1. A complete audiogram
2. A complete case history
3. Negative red flags
4. If mixed or conductive HL presents, offer referral (and you do need to have a relationship with an ENT). It's your pleasure to provide it.
5. On conductive, explain alternatives.

Criteria for Adequate Programming

- 6. Family Physician and contact information.
- 7. List of current medications for your Ototoxin search.
- 8. Desirable/necessary acoustical environments.
- 9. Family responsibility commitment.
- 10. Then, and only then, do you ask what color of hearing instruments they desire. If they look at you like you just dropped in from Mars,

Criteria for Adequate Programming

- 11. You will enjoy a level of trust that allows you to lead the Pt to accepting the Hearing Instrument style you believe will work.
- 12. If all of the criteria point to several potential styles, then offer them simple options.

Criteria for Adequate Programming

- is NOT selecting a CAR.

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Criteria for Adequate Programming

- They seek clearer understanding and a reversal of what they've been robbed of, no matter how euphemistic or dignified they may be in discussion of the subject.
- This isn't about hearing. It's about ...
  - COMMUNICATION AND LIFE QUALITY

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Fast Forward

- For custom applications, if there is any question about the direction of the sound tube (bore), use a fine tipped magic marker to indicate the tube's direction. Otherwise, the technician may point the sound tube into the canal wall. You can't have a worse beginning than one like that.
- Unless you request a non-programmed custom fitting, the instruments will come to you pre-programmed.

Before the

- If you are computer literate, you will notice the SW (software) variations between instrument providers.
  - Does the SW account for RECD? What is that, you ask?
  - Does the SW allow for user-friendly progressive adjustments?
  - Does it allow for easy curve matching for symmetrical balancing?

Criteria for Adequate Programming

- 13. On the audiogram. . .
  - Note the type of HL
  - Note the pattern
  - Note the severity
  - Note the DR (dynamic range)
  - SDS of PB's – this is mainly for recommendations.
- 14. Select the fitting range from technical data provided by the manufacturer.

Criteria for Adequate

- 14. . . .of your thinking the Output/Gain/Slope matrix.
- 15. Only present style options which make professional sense to you, options which will lead to better hearing and understanding, despite the vanity issues.
- 16. Only present styles with which you can work without ANY acoustical restraints.

Ok, what now?

- 17. Get your agreement to proceed and:
- a. take your ear molds (well over 90% of those with hearing loss require binaural to be correctly fitted. Fit monaurally ONLY if you can professionally justify it.
- b. if you have any doubts about dexterity, provide a non-working model to allow the user to handle one. Make recommendations then.

Notes

- As a rule, the more active the Pt, the more sophisticated the instrument.
- However, what did we come into the world with?
- Omni-directional, adaptive directional, and all the cardioids imaginable. . .
- Plus, we had the programs for SIN, distance, whatever. We had it all if we were born with normal hearing.

Notes

- The multi-memory, multi-channel, and microphonic programmable options (and more) are simply our methods to 'reconstruct' better hearing acuity in the hopes that better understanding will follow.
- The duration of UHL must be considered primary in determining how to program the instruments, instruct the Pt, and

Notes

- provide realistic expectations while you move through your protocol toward the Ultimate Fitting Plateau.

Programming Options

- Begin your programming by selecting a formula with which you are familiar. These formulae are listed in your SW. National Acoustics Laboratory, NAL NL-1, offers a non-linear model which deals with frequency responses and loudness in a unique way. Each manufacturer has a best fit that is good.

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Features

- You will be fitting instruments which are based on:
  - Multi-channel capability – Gain controls at different frequencies. You can selectively opt for 'frequency responses.'
  - Intensity dependent signal processing – automatic feature which adjusts gain depending on the natural intensity input.
  - Keep in mind the distinction between loudness and intensity……

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Features

- Multi-memory Programs – 3, 4 or 5 separate algorithms which you select to provide acute frequency responses in various optional acoustical environments. The more active the Pt, the more important and valuable the programming of these programs.
- Background Noise Reduction – Allows the hearing instrument to manage, to some degree, the intensity of "noise." This can provide a less-distracting acoustical environment.

Features

- Gain Reduction of Feedback – Programmable mechanism to reduce impact of feedback when detected by instrument.

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Hardware

- You will use a Hearing Instrument PROgramming device, acronymically designated the HIPRO BOX. You will also have wireless interfaces from most companies.
- They allow programming to take place between the Hearing Instrument DSP and your SW.
- You may load the SW individually or insert it into NOAH, a product of the Hearing Instrument Manufacturer's Software Alliance. HIMSA

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Features & Steps

- NOAH allows you to establish a profile of each Pt in one location, including personal information, audiometric data, fitting profile, photo, history, and each session's information.
- You attach the hearing instrument to the HIPRO Box with programming cables. Some manufacturers require the use of batteries during programming. Others do not.

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Steps

- Your cables will serially insert into HIPRO.
- Your instruments will have a male plug or receptacle inside the battery compartment.
- Once plugged in, the HIPRO handshakes the instruments with SW.
- When SW detects instruments, your first step will be to account for RECD.
- Once complete, you will move on the critical gain measurement, which is automatic and performed while the instrument is inserted and ON. Critical gain is basically a frequency ‘SWEEP’ that is run for each type of microphone profile.

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Steps

- If you ever are faced with interface interruption, it is almost always cabling. HIPROs are incredibly durable.
- In most SW, you can opt for ‘First Fit,’ which is a standard fitting protocol based on the formula you select, which you need to be familiar with for the exam.

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Steps

- Many manufacturers are moving toward progressive fitting menus. Of course, they don't call their menus "Progressive Fitting" because each "Best Practice Protocol" is defined by the licensed specialist. There are no hard and fast rules on how to manage and augment residual hearing capacity with the use of hearing instruments. Stay within the boundary of the law, and you are free to develop your own.

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Steps

- This menu includes parameters for
  - Inexperienced, first time users.
  - Users familiar with hearing instruments
  - Users experienced with hearing instruments
  - Final or optimal "fitting" profile.
- No personal experiences as identified in Reid Protocol are included in the various fitting level approaches stipulated by manufacturers; however, they can be used as such.

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Steps

- First step is to program omni-directional hearing under most predominant acoustical environment.
- When you have applied ‘First Fit,’ you move on to other memory program options, depending on the NEEDS of the Pt.
- Keep in mind that these programs represent algorithmic variations known to have some efficacy in those particular environments.

Steps

- They are not perfect for each situation. This is why you must establish a foundation of expectations and predictions upon which you build your fitting steps.
- The more you experiment with the SW, the more you will learn about gain, compression, kneepoints, etc. Basic tuning responses to subjective Pt considerations are simply automatic changes made that will probably help reduce the negative experiences.

Steps

- As soon as you can, learn how to manage each and every one of these features without even thinking about the menus.
- Many instruments have a data logging feature which lets you access data compiled when the user was away from the clinic.
- Instruments also now have remote controls which program volume and memories.

Steps

- Programming these features is very user-friendly.
- These steps hold true for all types of current generation hearing instruments.

Troubleshooting

- Distinction between trouble shooting and programming
  - Realistic Expectations
  - Re-learning phases
  - Background conflicts
  - Simple to Complex acoustical environments
  - Cognitive Re-training
  - DEALING WITH THE ABOVE IS NOT
    - TROUBLESHOOTING

Troubleshooting

- Troubleshooting deals with
- <u>unexpected interruptions in performance.</u>

Troubleshooting

- What will you have taught your Pt?
  - Insertion & Removal
  - No-fluid shell or BTE wipes
  - Cerumen removal
  - The use of MiraCell ProEar drops
  - How to use their hearing aid magnet
  - Where hearing aids get lost. . .

Troubleshootin

- The main enemies of hearing aids are:
  - WATER
  - WAX
  - USERS
  - PETS
  - HOSPITALS
  - GARDENS
  - SHOWERS
  - HAIRSPRAY

Troubleshooting

- Not to think this is funny
- Nothing is more distracting and disappointing that becoming accustomed to a very expensive device only to find that a simple attempt to clean it, almost ruined it.
- What can you do about these things?

Troubleshootin

- Advise the new user (warn, actually) about all of the enemies of instruments.
- Realistically prepare the Pt for ALL eventualities.
- Practical advisement will REDUCE troubleshooting in your clinic.
- You are well served to be realistic and assertive in discussing proper care of these devices.

Troubleshooting

- Even then, you will be troubleshooting.

- Tools
  - Rene Laennec's stethoscope, or a newer model
  - Set of Dental Tools
  - Tissue
  - Alcohol

Tools

- Finger Light for crack detection
- Microscope LED Magnified light
- Cleaning Brush
- Dri-Aid (for sale and use)
- Batteries, always batteries
- Red Wing polishing and buffing wheel
- The latest patching materials
- Vacuum Pump

Never Miss The Opportunity

- To inspect the user's ear canal.
- Hearing Instruments are foreign objects and trigger escalating cerumen production
  - Use Otoscope
  - Curettes
  - Pt Chart
  - And, the question – "On any new meds?"

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Steps

- Who, when, why, what, and how?
- Is sound effected?
- How?
- Now, you have the user place the instrument on a clean tissue, and using clean procedures, examine the instrument. Use every tool you have that will help.
- Next, listen to the instrument.

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Steps

- When you listen, think "BAD BATTERY."
- Replace it.
- Listen again.
  - For reduced output or gain
  - Buzzing
  - Intermittent sound
  - Noise
  - Distortions of any type

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Steps

- Check for contact corrosion (water and dirt)
- Check battery for contact scratches.
- If none, repair them.
- Check for cracks, splits, faceplate disconnections. If there, use patching material.
- Buff and wipe.

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Steps

- Or, and
- Check for plugged receiver (sound tube) tube. Remove contents with loop or dental tools. Vacuum out.
- Check for plugged vent. Bore vent with plastic line.
- Check microphone for dirt or shiny hairspray.
- Check battery door and inside.

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Steps

- Check for disconnected wires and FO's.
- Remove FO's with care.

- Rattle the aid around while stethoscope is attached and listen to the performance.
- Manipulate VC.
- Listen for clarity of sound.
- Occlude the aid and listen for feedback.
- If you have not solved the problem, fit them with an additional set and send the originals off for repair…

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Final Notes on Programming

- While we know something about plasticity and reduced auditory capacity, we know very little about adult cognitive re-learning as it applies to hearing loss correction.
- By adopting a conservative, progressive fitting protocol, we are essentially re-creating the original process of learning to understand in simple-to-complex acoustical environments.

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Final Notes on

- Since legislation will not mandate best practice protocol, it is up to you to determine how best to serve patients.

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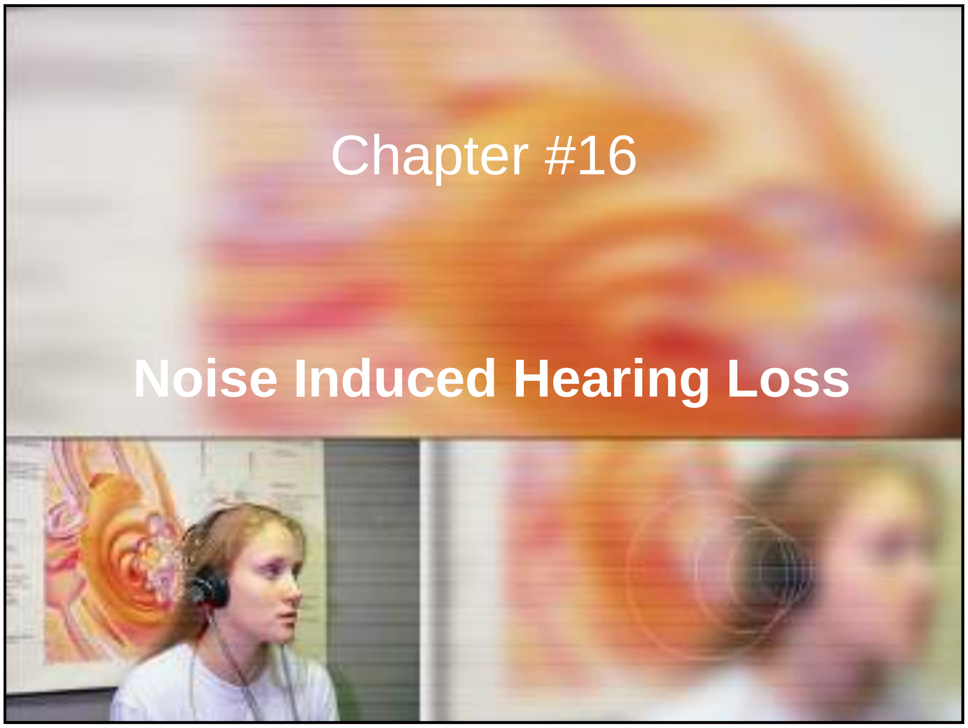
Chapter 16: Noise Induced Hearing Loss


Chapter #16
Noise Induced Hearing Loss

Noise Induced Hearing Loss

- Definitions
- Acoustic Trauma vs. Chronic NIHL
- Physiology/Pathophysiology/Histopatholo gy
- Susceptibility and Interactions
- Hearing Impairment vs. Hearing Handicap vs. Disability
- Legislation and Worker's Compensation

Noise

- An unwanted or unpleasant sound.
- An intense sound capable of damaging the inner ear.
- Temporal patterns
- Measurement of noise

Acoustic Trauma

- Sudden, permanent SNHL caused by single exposure to an intense sound.
- Impulse sound, 130-140dB
- Presentation
- Examination
- Audiogram
- Management

Chronic NIHL

- Gradual hearing loss occurring over years of exposure to noise.
- Prevalence
- Industrial vs. Non-industrial
- Temporary Threshold Shift
- Permanent Threshold Shift

Chronic NIHL

- Damage Risk Criteria
  - Total sound energy
  - Every 3dB increase in sound intensity leads to a doubling of sound pressure.

Chronic NIHL

- OSHA Regulations
  - 5dB rule
  - Allowable levels
    - 90dBA for 8 hours
    - 95dBA for 4 hours
    - 100dBA for 2 hours
    - 105dBA for 1 hour
    - 110dBA for 30 minutes
    - 115dBA for 15 minutes

Chronic NIHL

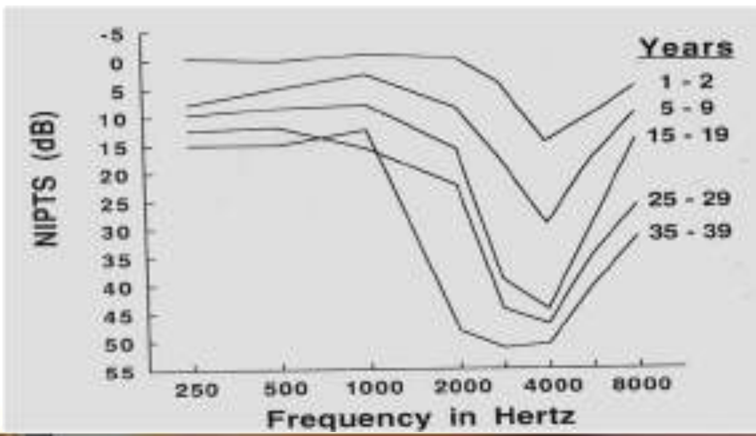
- Defining Characteristics
  - Always sensorineural
  - Nearly always bilateral and symmetric
  - Does not produce a profound hearing loss
  - Will not progress once noise exposure discontinued

Chronic NIHL

- Rate of loss decreases as threshold increases
- Most severe loss at the 4kHz frequency
  - 3-6kHz losses are greater than 500Hz-2kHz
- Maximum loss seen after 10-15 years of exposure
- Continuous noise is more damaging than intermittent noise
  - American College of Occupational Medicine
  - Noise and Hearing Conservation Committee

Chronic NIHL

- Defining Characteristics



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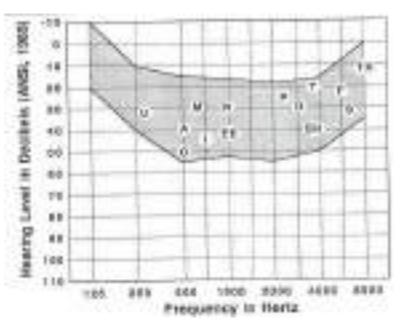
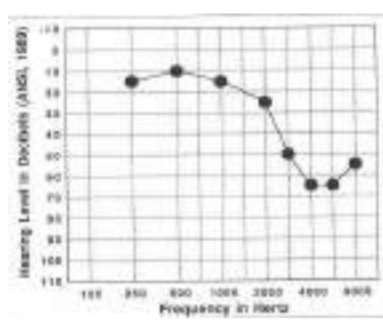
Chronic NIHL

- Presentation
- Audiogram





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Chronic NIHL

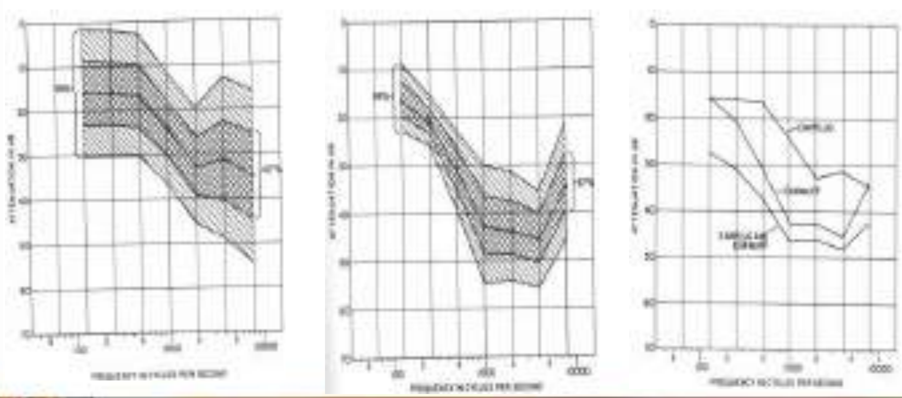
- Hearing Conservation Programs
  - Assessment of Noise Levels
  - Engineering Controls
  - Administrative Controls
  - Personal Hearing Protectors
  - Serial Audiograms

Chronic NIHL

- Personal Hearing Protectors
- Earplugs Earmuffs Canal Caps

Chronic NIHL

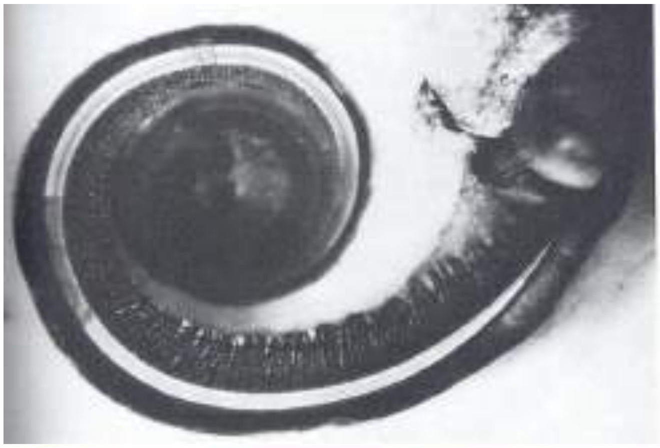
- Personal Hearing Protectors—Attenuation
- Earplugs Earmuffs Both



Physiology/Pathophysiology

- External Ear
  - Resonant frequency = speed of sound/4 x EAC length
- Middle Ear
  - Acoustic Reflex
- Inner Ear
  - IHC vs. OHC
  - Supporting cells
  - Nervous structures
  - Blood vessels

Histopathology



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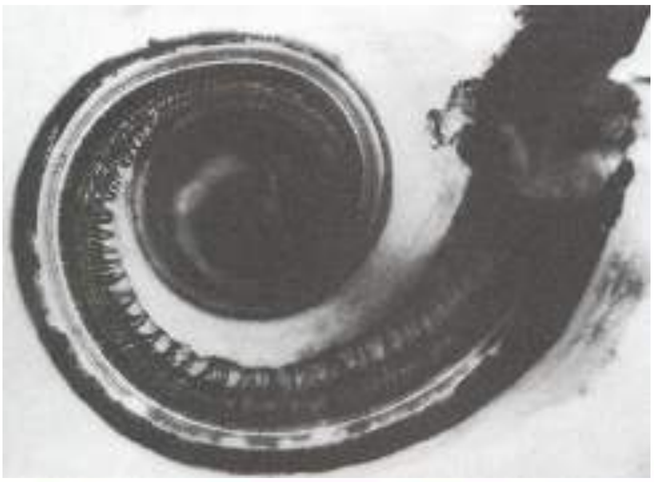
Histopathology



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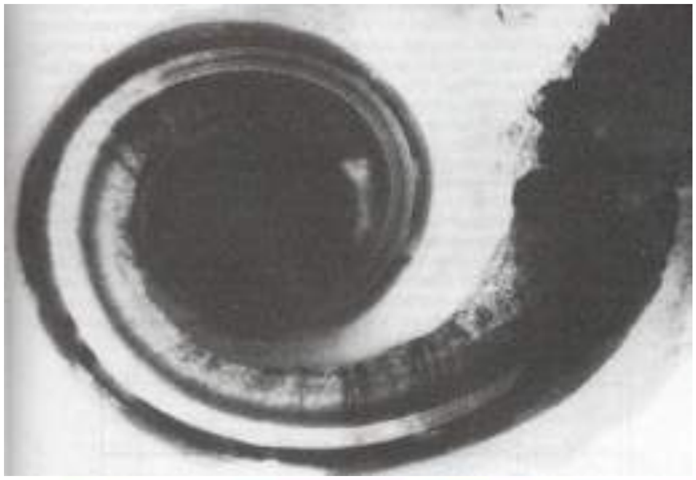
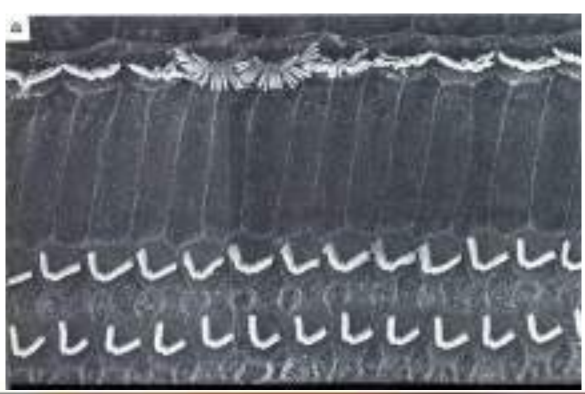
Histopathology



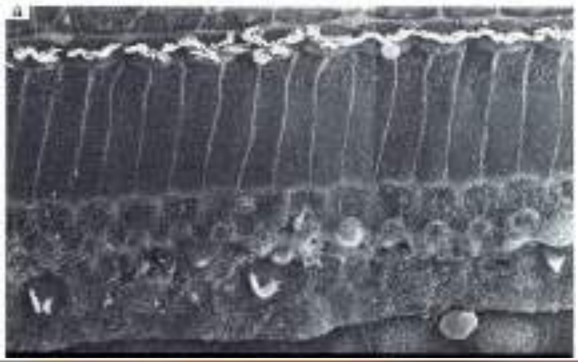
Histopathology

- Acoustic Trauma



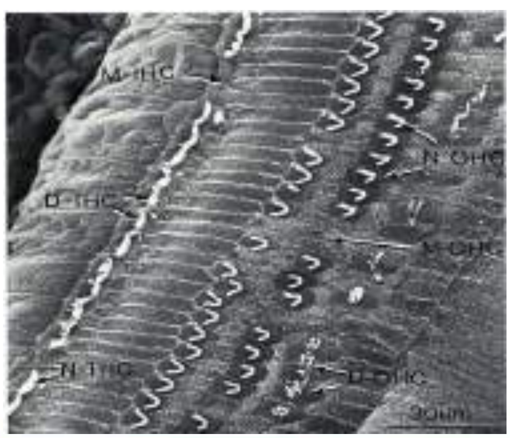
Histopathology

- Acoustic Trauma



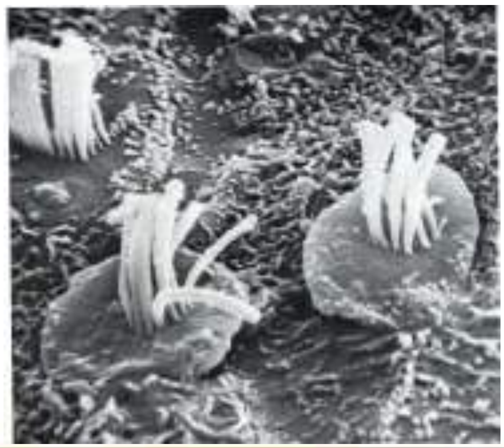
Histopathology

- Industrial Noise



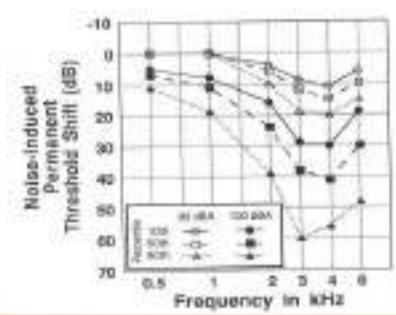
Histopathology

- Industrial Noise



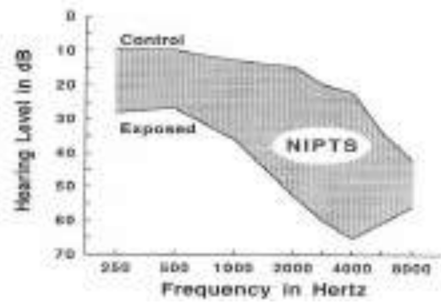
Susceptibility

- 5% of individuals exposed to 80dBA noise levels develop a significant hearing loss.
- 5-15% for 85dBA exposure
- 15-25% for 90dBA exposure
- Why?



Interactions

- AIHL vs. NIHL



- $\text{Total HL} = \text{NIHL} + \text{AIHL} - \dfrac{(\text{NIHL})(\text{AIHL})}{120}$

Interactions

- Presbycusis
- Ototoxic drugs
  - Aminoglycosides
  - Cisplatin
  - Lasix
  - Aspirin
- Chemicals
  - Toluene
  - Carbon monoxide
  - Carbon disulphide
- Vibration

Impairment/Handicap/Disability

- Hearing Impairment
  - “a change for the worse in either structure or function, outside the range of normal”
- Hearing Handicap
  - “the disadvantage imposed by an impairment sufficient to affect a person’s efficiency in the activities of daily living”
- Disability
  - “an actual or presumed inability to remain employed at full wages”

Hearing

- AAO-1979 Rule
- Establish thresholds at 500Hz and 1-3kHz
- Calculate average monaural thresholds
- Assume handicap begins when thresholds exceed 25dB and increases by 1.5% for each additional decibel loss

Legislation

- Walsh-Healy Public Contracts Act, 1969
- Occupational Safety and Health Act, 1970
- Clean Air Act, 1970
- Bulletin #334, 1971
- Noise Control Act, 1972
- Hearing Conservation Amendment, Final Rule, 1983

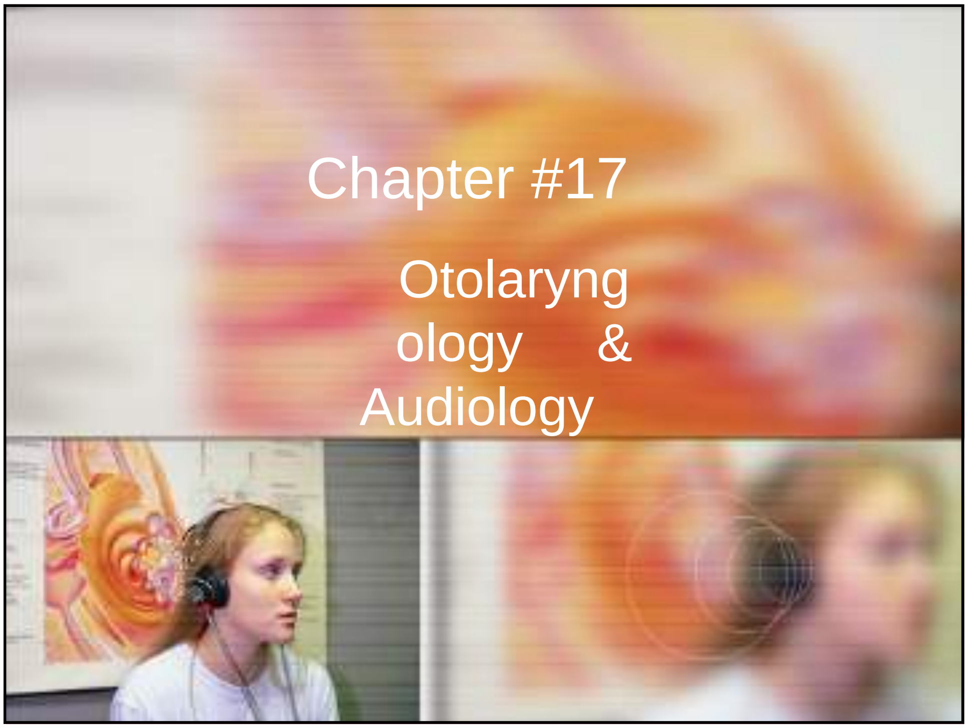
Worker's

- Provides payment to cover lost wages and medical expenses accrued by a worker as a result of an injury sustained on the job.
- Based on hearing handicap, most often as calculated by the AAO-1979 rule.

Otolaryngologist's Role

- Otolaryngologist's role:
  - Complete history and physical
  - Audiogram
  - Diagnostic conclusions

Chapter 17: Otolaryngology & Audiology



Definitions

- Otolaryngology: branch of medicine that specializes in the diagnosis and treatment of ear, nose, throat, and head and neck disorders. A commonly used term for this specialty is ENT (ear, nose and throat).

- Audiology: branch of Science that studies hearing, balance and related disorders.

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Education

- Otolaryngologist: Medical doctors who complete at least five years of surgical residency training (composed of one year in general surgical training and four years in otolaryngology - head and neck surgery).

- Audiologist: doctoral degree (AuD or PhD); autonomous practitioners and do not need physician orders or supervision.

Specialities

Otolaryngologist

- **Dizziness**
  - **Meniere's**
  - **Perilymphatic fistula**
  - **Acoustic neuroma**
- **Hearing Loss**
- **Otitis externa, media, interna**
- **Perforated Eardrum**

Specialties

- Rhinology (sinus diseases)
- Pediatrics
  - **Tonsillectomy**
  - **Adenoidectomy**
  - **Myringotomy & tubes**
- Laryngology
  - **Laryngitis**
  - **Tracheostomy**
  - **Cancer**

Specialties

- Facial Plastic & Reconstructive Surgery
  - **Facelift**
  - **Browlift**
  - **Otoplasty**
  - **Trauma to the face area**

Specialties

Audiologist

- **Identify, diagnose, treat, and monitor disorders of the auditory and vestibular system**
- **Recommend cochlear implants**
- **Design and implement personal and industrial hearing safety programs**
- **Design and implement newborn hearing screening programs**
- **Design and implement school hearing screening programs**

Specialties

- **Auditory research**
- **Speech Pathology counseling and therapy**
- **Dispense hearing instruments**

Audiologists may work in private practice and specialize in pediatric speech and language pathology or may specialize in adult hearing loss correction. They may also work in conjunction with Otolaryngologists or in industry.

Interrelations

- ENT and Audiologist
  - **As Employer – Employee**
  - **As referrers**
- ENT and Hearing Instrument Specialist
  - **Unilateral referral**
  - **Co-Referrals?**
- Primary Care Physicians

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Common Patient Protocol

- Sensorineural HL
- NIHL
- SSNHL
- Meniere's Disease
- Outer and Middle Ear Conditions
- Tympanoplasty
- Cochlear Implants

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Remember your Numbers

- Total Population of PWHL
- 19,000,000/11 years
- 1993 Statistics (The BIG 23%)
- Focus on 5. . .
- And 12.5%
- And 3/day
- And 30%
- And less than 3%

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Sudden Sensorineural Hearing Loss

- First described in 1944 by DeKleyn
- Incidence: 5-20 per 100,000
- 4,000 new cases/year in US
- Idiopathic
- Hearing loss in 3 contiguous frequencies of at least 30 dB

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Sudden Sensorineural Hearing Loss

- **Some authors use at least 20 dB loss**
- Onset of hearing loss occurs in less than 72 hours
- Recovery rate without treatment 32% - 79%
  - **Usually within 2 weeks of onset**
  - **Only 36% with complete recovery**
- No middle ear disease
- Otologic emergency!

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Sudden Sensorineural Hearing Loss

- Clinical Presentation
  - **Sudden onset hearing loss**
    - Less than 3 days
  - **Usually unilateral**
    - Left side possibly more common (55%)
    - Bilateral 2%
  - **Median age 40-54**

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Sudden Sensorineural Hearing Loss

- **Equal among males and females**
- **Awakening from sleep**
- **Hearing a "popping" prior to hearing loss**
- **Aural fullness**
- **Tinnitus**
- **Vertigo**

Sudden Sensorineural Hearing Loss

- Differential Diagnosis
  - **Infectious**
    - Bacterial: meningitis, labyrinthitis, syphilis
    - Viral: Mumps, CMV
  - **Inflammatory**
    - Autoimmune, Cogan syndrome, Lupus, MS
  - **Traumatic**
    - Temporal bone fracture, acoustic trauma, perilymph fistula

UTMB

Sudden Sensorineural Hearing Loss

- **Neoplastic**
  - CPA tumor, temporal bone metastasis
- **Toxic**
  - Aminoglycosides, aspirin
- **Vascular**
  - Thromboembolism, macroglobulinemia, sickle cell disease, cerebral infarct, TIA
- **Congenital**
  - Mondini malformation, enlarged vestibular aqueduct

Sudden Sensorineural Hearing Loss

- Theories
  - **Viral infection**
- Etiology still unclear

Sudden Sensorineural Hearing Loss

- Histopathology of human temporal bones
  - **Atrophy of organ of Corti, spiral ganglion, tectorial membrane**
  - **Hair cell loss**
  - **Unraveling of myelin**

Sudden Sensorineural Hearing Loss

- Challenges
  - **True incidence is not known**
  - **Patients with spontaneous recovery usually do not present to an otolaryngologist**
  - **Patients may present beyond what is considered to be therapeutic window**

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Sudden Sensorineural Hearing Loss

- Clinical Evaluation
  - **History**
  - **Complete head and neck exam**
  - **Audiogram including pure-tone audiometry (PTA), speech reception threshold (SRT), and speech discrimination scores (SDS)**

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Sudden Sensorineural Hearing Loss

- **Tympanometry**
- **+/- Auditory brainstem response (ABR)**
- **and otoacoustic emission (OAE)**

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Sudden Sensorineural Hearing Loss

- Treatment: Systemic Steroids
  - Historical perspective: Reduce inner ear inflammation
  - Nonspecific
  - Dependent on time to therapy
  - Oral, IV
  - Variable to poor response for profound SSNHL

Wilson (1980)

- Patients stratified by type of audiogram
  - **Mid-frequency loss**
  - **Loss at 4 kHz greater/equal to loss at 8 kHz**
  - **Loss at 8 kHz greater than loss at 4 kHz**
  - **Profound loss greater than 90 dB PTA**
  - **Unaffected ear used as reference**

Wilson (1980)

- Prognostic factors
  - **Vertigo not statistically significant**
  - **Age less than 40 years favorable for recovery**
  - **Type of audiogram**
    - Midfrequency loss with best recovery
    - Profound loss less likely to have recovery
    - Loss between 40 dB – 85 dB more likely to respond to steroid therapy

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Wilson (1980)

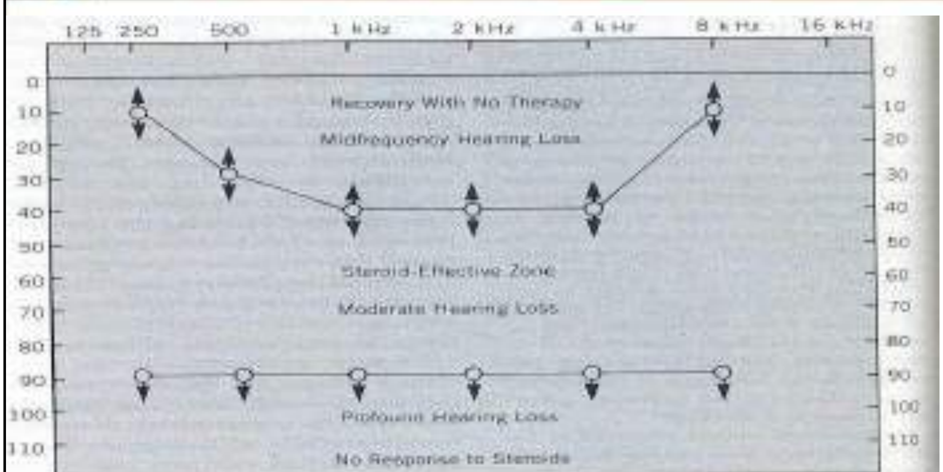

Fig 2.—Categories of sudden hearing loss as determined by spontaneous recovery rate and response to steroid therapy.

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Wilson (1980)

- Relative Odds for recovery
  - **Steroids vs Placebo 4.95:1**
  - **Steroids vs untreated controls 4.06:1**
  - **Untreated controls vs Placebo 1.22:1**
  - **Steroids vs all control 4.39:1**

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Xenellis (2006)

- **Results**
  - **47% treated with IT steroids improved > 10 dB**
  - **No controls improved**
  - **No adverse outcomes**

Sudden Sensorineural Hearing Loss

- Take Home Messages:
  - **SSNHL is an otologic emergency**
  - **Systemic steroids are mainstay of therapy**
  - **Better prognosis if treatment started early (within 4 weeks of onset)**

Chapter 18: Treatments for Meniere's Disease


Chapter #18
Treatments for Meniere’s Disease

History

- **1861 – Prosper Meniere describes classic symptoms and attributes to labyrinth**
- **1871 – Knappin theorizes dilatation of membranous Labyrinth**
- **1938 – Hallpike and Portman confirm endolymphatic hydrops via temporal bone histology**
- **1972 – AAOO defines the disease criteria**
- **1985 – AAO-HNS revises the definition and establishes reporting protocols**
- **1995 – AAO-HNS revises the definition and reporting protocols again**

Physiology

- Perilymph
  - Located in the Scala Vestibuli / Tympani
  - Similar in composition to CSF
  - High Na+, Low K+
- Endolymph
  - Located in the Scala Media
  - Similar in compostion to ICF
  - Low Na+ High K+
  - Site of production in Stria Vascularis
- Membranous Labyrinth separates the compartments
  - No difference in pressure

Pathophysiology

- Endolymphatic hydrops leads to distortion of membranous labyrinth
- Reisner's membrane can be seen bulging into the scala vestibuli in some histologic studies
- Microruptures may lead to episodic attacks which resolve when the tears heal

Pathophysiology

- Theories behind endolymphatic hydrops (edema)
  - Obstruction of endolymphatic duct/sac
  - Hypo-plasia of endolymphatic duct/sac
  - Alteration of absorption of endolymph
  - Alteration in production of endolymph
  - Autoimmune insult
  - Vascular origin
  - Viral etiology

Diagnosis

AAO-HNS CHE *1985*

- **Meniere's is diagnosed by**
  - **Vertigo**
    - **Spontaneous, lasting minutes to hours**
    - **Recurrent, must have more than 1 episode**
    - **Associated with nystagmus**
  - **Hearing loss**
    - **Fluctuating sensorineural**
    - **Low-frequency or flat**
  - **Tinnitus**

AAO-HNS CHE *1985*

- Vertigo treatment reporting standard
  - 0 = Complete control
  - 1-40 = Substantial control
  - 41-80 = Limited control
  - 81-120 = Insignificant control
  - > 120 = Worse

AAO-HNS CHE *1985*

- Hearing treatment reporting standard
  - PTA reported 500, 1000, 2000, 3000 kHz
  - If multiple pre and post levels are available, the worst is always used
  - PTA is considered improved / worse if a 10 dB difference is noted
  - SDS is considered improved / worse if a 15% difference is noted

AAO-HNS CHE *1995*

- Meniere's is diagnosed by
  - Vertigo
    - Spontaneous, lasting minutes to hours
    - Recurrent, must have 2 episodes > 20 min.
    - Nystagmus during episodes

AAO-HNS CHE *1995*

- Hearing loss
  - Avg (250, 500, 1000) 15 dB < Avg (1000, 2000, 3000) or
  - Avg (500, 1000, 2000, 3000) 20 dB > than other ear
  - For bilateral disease Avg (500, 1000, 2000, 3000) > 25 dB in the studied ear

AAO-HNS CHE *1995*

- *Possible* Meniere's disease
  - Episodic vertigo of the Meniere's type without documented hearing loss, or
  - Sensorineural hearing loss, fluctuating or fixed, with dysequilibrium but without definitive episodes
  - Other causes excluded

AAO-HNS CHE *1995*

- *Probable* Meniere's *disease*
  - One definitive episode of vertigo
  - Audiometrically documented hearing loss on at least one occasion
  - Tinnitus or aural fullness in the treated ear
  - Other causes excluded

AAO-HNS CHE *1995*

- *Definite* Meniere's *disease*
  - Two or more definitive spontaneous episodes of vertigo 20 minutes or longer
  - Audiometrically documented hearing loss on at least one occasion
  - Tinnitus or aural fullness in the treated ear
  - Other cases excluded
  - *See staging chart*

AAO-HNS CHE *1995*

- *Certain* Meniere's *disease*
  - Definite Meniere's disease, plus histopathologic confirmation
  - *See staging chart*

AAO-HNS CHE *1995*

Stage	PTA
1	<=25
2	26-40
3	41-70
4	>70

AAO-HNS CHE *1995*

Functional Level Scale

Regarding my current state of overall function, not just during attacks (check the ONE that best applies):

My dizziness has no effect on my activities at all.

AAO-HNS CHE *1995*

When I am dizzy I have to stop what I am doing for a while, but it soon passes and I can resume activities. I continue to work, drive, and engage in any activity I choose without restriction. I have not changed any plans or activities to accommodate my dizziness.

AAO-HNS CHE *1995*

When I am dizzy, I have to stop what I am doing for a while, but it does pass and I can resume activities. I continue to work, drive, and engage in most activities I choose, but I have had to change some plans and make some allowance for my dizziness.

AAO-HNS CHE *1995*

I am able to work, drive, travel, take care of a family, or engage in most essential activities, but I must exert a great deal of effort to do so. I must constantly make adjustments in my activities and budget my energies. I am barely making it.

AAO-HNS CHE *1995*

I am unable to work, drive, or take care of a family. I am unable to do most of the active things that I used to. Even essential activities must be limited. I am disabled.

I have been disabled for 1 year or longer and/or I receive compensation (money) because of my dizziness or balance problem.

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"Natural History"

- Silverstein *et al* (1989)
  - 1985 AAO criteria
  - Studied a group of patients who failed medical treatment and declined surgery
  - Vertigo
    - 57-60% complete control in 2 years
    - 71% complete control at 8 years (average)

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"Natural History"

- Conclusion
  - "Given sufficient length of follow-up, a large proportion of patients will have a spontaneous 'cure' of vertigo."

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Final Thought

Research to verify natural history of Meniere's disease would be beneficial in evaluation of long-term treatment efficacy.

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Chapter 19: Infections of the External Ear

Chapter #19

Infections of the External Ear

Credits to UTMB

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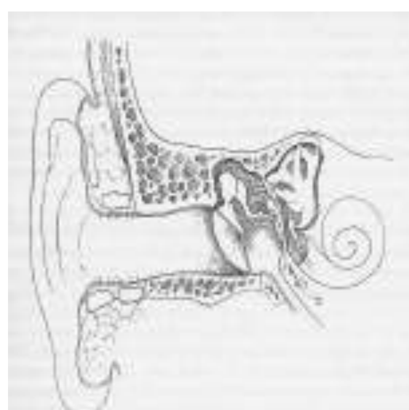
Jeffrey Vrabec, MD
March 21, 2001

Anatomy and Physiology

- Consists of the auricle and EAM
- Skin-lined apparatus
- Approximately 2.5 cm in length
- Ends at tympanic membrane

Anatomy and Physiology

- Auricle is mostly skin-lined cartilage
- External auditory meatus
  - Cartilage: ~40%
  - Bony: ~60%
  - S-shaped
  - Narrowest portion at bony-cartilage junction



Anatomy and Physiology

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Anatomy and Physiology

- EAC is related to various contiguous structures
  - Tympanic membrane
  - Mastoid
  - Glenoid fossa
  - Cranial fossa
  - Infratemporal fossa

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Anatomy and Physiology

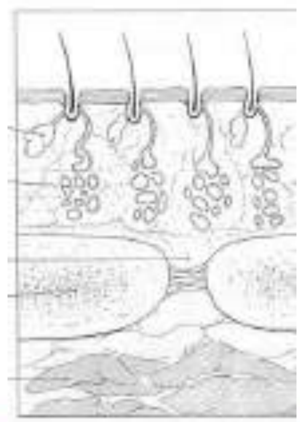
- Innervation: cranial nerves V, VII, IX, X, and greater auricular nerve
- Arterial supply: superficial temporal, posterior and deep auricular branches
- Venous drainage: superficial temporal and posterior auricular veins
- Lymphatics

Cranial

- V Trigeminal – receives sensation from the face and ennervates muscles of mastication
- VII Facial Nerve – Motor ennervation to facial expression muscles and to the stapedius
- IX Glossopharyngeal – Taste, pain and thermal sensation
- X Vagus – Controls muscles for voice resonance and other motor and sensations

Anatomy and Physiology

- Squamous epithelium
- Bony skin – 0.2mm
- Cartilage skin
  - 0.5 to 1.0 mm



Otitis

- Bacterial infection of external auditory canal
- Categorized by time course
  - Acute
  - Subacute
  - Chronic

Acute Otitis Externa (AOE)

- “swimmer’s ear”
- Preinflammatory stage
- Acute inflammatory stage
  - Mild
  - Moderate
  - Severe

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AOE: Preinflammatory Stage

- Edema
- Symptoms: sense of fullness
- Signs: mild edema
- Starts the itch/scratch cycle

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AOE: Mild to Moderate Stage

- Progressive infection
- Symptoms
  - Pain
  - Increased pruritus (itch cycle)
- Signs
  - Erythema (redness)
  - Increasing edema
  - Canal debris, discharge

AOE: Severe Stage

- Severe pain, worse with ear movement
- Signs
  - Lumen obliteration
  - Purulent (draining puss) otorrhea
  - Involvement of periauricular soft tissue

AOE: Treatment

- Four principles
  - Frequent canal cleaning
  - Topical antibiotics
  - Pain control
  - Instructions for prevention

Chronic Otitis Externa (COE)

- Chronic inflammatory process
- Persistent symptoms (> 2 months)
- Bacterial, fungal

COE: Symptoms

- Unrelenting
- Mild discomfort
- Dryness of canal skin

COE: Signs

Dry, flaky skin

Otorrhea (occasional)

COE: Treatment

- Similar to that of AOE
- Topical antibiotics, frequent cleanings
- Topical Steroids
- Surgical intervention

Furunculosis (boils)

- Acute localized infection
- Lateral 1/3 of canal
- Obstructed sebaceous unit

Furunculosis: Symptoms

- Localized pain
- Pruritus
- Hearing loss (if lesion occludes canal)

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Furunculosis:

- Edema
- Erythema
- Tenderness

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Furunculosis: Treatment

- Local heat
- Analgesics
- Oral anti-staphylococcal antibiotics
- Incision and drainage reserved for localized abscess
- IV antibiotics for soft tissue extension

Otomycosis (fungus)

- Fungal infection of EAC skin
- Most common organisms: *Aspergillus* and *Candida*

Otomycosis: Symptoms

- Often indistinguishable from bacterial OE
- Pruritus deep within the ear
- Dull pain
- Hearing loss (obstructive)
- Tinnitus

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Otomycosis: Signs

- Canal erythema
- Mild edema
- White, gray or black fungal debris

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Otomycosis

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Otomycosis: Treatment

- Thorough cleaning and drying of canal
- Topical antifungals

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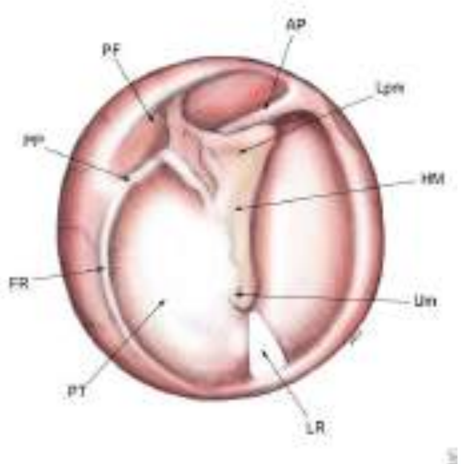
Granular Myringitis (GM)

- Localized chronic inflammation of pars tensa with granulation tissue
- Toynbee described in 1860
- Sequela of primary acute myringitis, previous OE, perforation of TM
- Common organisms: *Pseudomonas, Proteus*

Normal Tympanic

- Pars tensa (PT)
- pars flaccida (PF)
- light reflex (LR)
- fibrous ring (FR)
- umbo (Um)
- handle of malleus (H
- lateral process of malleus (Lpm)
- anterior plica (AP)
- posterior plica (PP)



GM: Symptoms

- Foul smelling discharge from one ear
- Often asymptomatic
- Slight irritation or fullness
- No hearing loss or significant pain

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GM: Signs

- TM obscured by pus
- “peeping” granulations
- No TM perforations

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GM: Treatment

- Careful and frequent debridement
- Topical anti-*pseudomonal* antibiotics
- Occasionally combined with steroids
- At least 2 weeks of therapy
- May warrant careful destruction of granulation tissue if no response

Bullous

- Viral infection
- Confined to tympanic membrane
- Primarily involves younger children

Bullous Myringitis: Symptoms

- Vesicles form on TM from bacterial infection
- Sudden onset of severe pain
- No fever
- No hearing impairment
- Bloody otorrhea (significant) if rupture

Bullous Myringitis: Signs

- Inflammation limited to TM & nearby canal
- Multiple reddened, inflamed blebs (blisters)
- Hemorrhagic vesicles

Bullous Myringitis: Treatment

- Self-limiting
- Analgesics
- Topical antibiotics to prevent secondary infection
- Incision of blebs is unnecessary

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Necrotizing External Otitis (NEO)

- Potentially lethal infection of EAC and surrounding structures
- Typically seen in diabetics and immunocompromised patients
- *Pseudomonas aeruginosa* is the usual culprit

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NEO: History

- Meltzer and Kelemen, 1959
- Chandler, 1968 – credited with naming

NEO: Symptoms

- Poorly controlled diabetic with OE
- Deep-seated aural pain
- Chronic otorrhea
- Aural fullness

NEO: Signs

- Inflammation and granulation
- Purulent secretions
- Occluded canal and obscured TM
- Cranial nerve involvement

NEO: Imaging

- Plain films
- Computerized tomography – most used
- Technetium-99 – reveals osteomyelitis (bacterial infection of the bone)
- Gallium scan – useful for evaluating Rx
- Magnetic Resonance Imaging

NEO: Diagnosis

- Clinical findings
- Laboratory evidence
- Imaging
- Physician's suspicion
- Cohen and Friedman – criteria from review

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NEO: Treatment

- Intravenous antibiotics for at least 4 weeks – with serial gallium scans monthly
- Local canal debridement until healed
- Pain control
- Use of topical agents controversial
- Hyperbaric oxygen experimental
- Surgical debridement for refractory cases

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NEO: Mortality

- Death rate essentially unchanged despite newer antibiotics (37% to 23%)
- Higher with multiple cranial neuropathies (60%)
- Recurrence not uncommon (9% to 27%)
- May recur up to 12 months after treatment

Perichondritis/Chondri

- Infection of perichondrium (fibrous membrane which surrounds cartilage)/cartilage
- Result of trauma to auricle
- May be spontaneous (overt diabetes)

Perichondritis: Symptoms

- Pain over auricle and deep in canal
- Pruritus

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Perichondritis: Signs

- Tender auricle
- Induration
- Edema
- Advanced cases
  - Crusting & weeping
  - Involvement of soft tissues

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Relapsing Polychondritis

- Episodic and progressive inflammation of cartilages
- Autoimmune etiology?
- External ear, larynx, trachea, bronchi, and nose may be involved
- Involvement of larynx and trachea causes increasing respiratory obstruction

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Relapsing

- Fever, pain
- Swelling, erythema
- Anemia
- Treat with oral corticosteroids

50

Herpes Zoster Oticus

- J. Ramsay Hunt described in 1907
- Viral infection caused by varicella zoster
- Infection along one or more cranial nerve dermatomes (shingles)
- Ramsey Hunt syndrome: herpes zoster of the pinna with otalgia and facial paralysis

Herpes Zoster Oticus: Symptoms

- Early: burning pain in one ear, headache, malaise and fever
- Late (3 to 7 days): vesicles, facial paralysis

Herpes Zoster Oticus: Treatment

- Corneal protection
- Oral steroid taper (10 to 14 days)
- Antivirals

Erysipelas

- Acute superficial cellulitis
- Group A, beta hemolytic streptococci
- Skin: bright red; well-demarcated, advancing margin
- Rapid treatment with oral or IV antibiotics if insufficient response

Perichondritis: Treatment

- Mild: debridement, topical & oral antibiotic
- Advanced: hospitalization, IV antibiotics
- Chronic: surgical intervention with excision of necrotic tissue and skin coverage

Radiation-Induced Otitis Externa

- OE occurring after radiotherapy
- Often difficult to treat
- Limited infection treated like COE
- Involvement of bone requires surgical debridement and skin coverage

Conclusions

- Careful History
- Thorough physical exam
- Understanding of various disease processes common to this area
- Vigilant treatment and patience

Chapter 20:

Typanoplasty

Chapter #20

Typanoplasty

Credits to UTMB

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 2

Outline

- Define terms
- History
- Anatomy and Embryology
- Physiology of sound transmission
- Etiology
- Preoperative evaluation
- Techniques
- Tympanoplasty in children
- Complications
- Results

Introduction

- Myringoplasty - reconstruction of a perforation of the tympanic membrane (TM)
  - Assumes – normal middle ear (ME) mucosa (mucus membranes) and ossicles
  - TM is not elevated from its sulcus

Introduction

- Tympanoplasty – reconstruction of the TM
  - Also includes addressing middle ear pathology
    - Cholesteatoma, adhesions
    - Ossicular chain problems
    - Usually involves elevating the TM from its sulcus (depression)

Introduction

- Tympanoplasty is sub-classified based on
  - Medial or lateral grafting
  - Associated type of ossicular chain reconstruction (OCR)

History

- 1640 – Banzer
  - First attempt at repair of a TM perforation
  - Used pigs bladder as a lateral graft
- 1853 – Toynbee
  - Placed a rubber disk attached to a silver wire over the TM
  - Reported significant hearing improvement
- 1863 – Yearsley
  - placed a cotton ball over a perforation
- 1877 – Blake
  - Paper patch

History

- 1876 – Roosa
  - Treated TM perf. with chemical cautery
- 1878 – Berthold
  - Coined the term myringoplasty
  - Placed cork plaster against TM to remove epithelium
  - Applied a FTSG

History

- 1950s – Wullstein and Zollner
  - STSG over de-epithelialized TM
- 1956 - Wullstein
  - Described five types of tympanoplasty
- 1957 – first medial graft performed by Shea with vein graft
- 1961 – Storrs
  - introduced the use of temporalis fascia grafting
  - Medial grafting
- 1961 and 1967 – House, Glasscock and Sheehy
  - Developed and refined techniques for lateral grafting

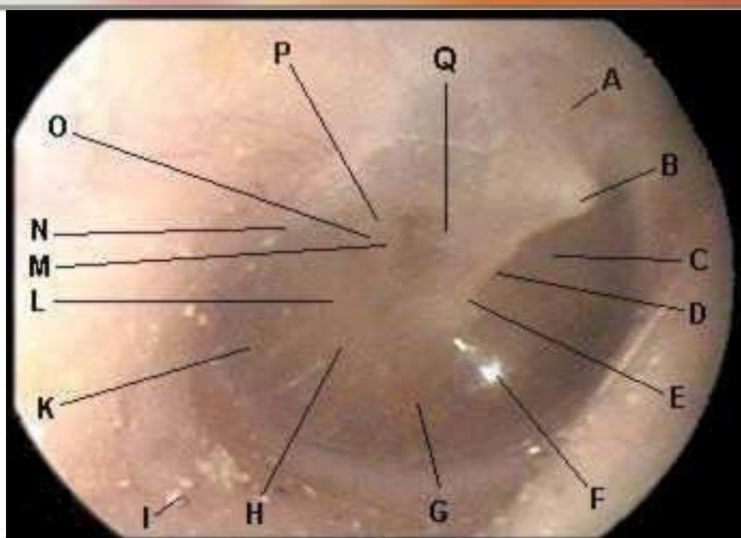
Embryolog

- 4th week of gestation
- TM develops from three sources
  - Ectoderm – 1st branchial groove
  - Endoderm – 1st branchial pouch
  - Mesoderm – 1st and 2nd branchial arches

Anatomy

- TM is oval in shape
  - 8 mm X 10 mm
  - 55 degrees to the floor of the meatus
  - Near circumferential fibro-cartilaginous thickening
    - Annular ligament or annulus
  - 3 layers – 130 microns thick
    - Outer epithelial – keratinizing squamous
    - Middle fibrous – superficial radial, deep circular
    - Inner – mucosa
  - Epithelial migratory pattern
    - Centrifugal growth for the umbo outward

Anatomy



Anatomy

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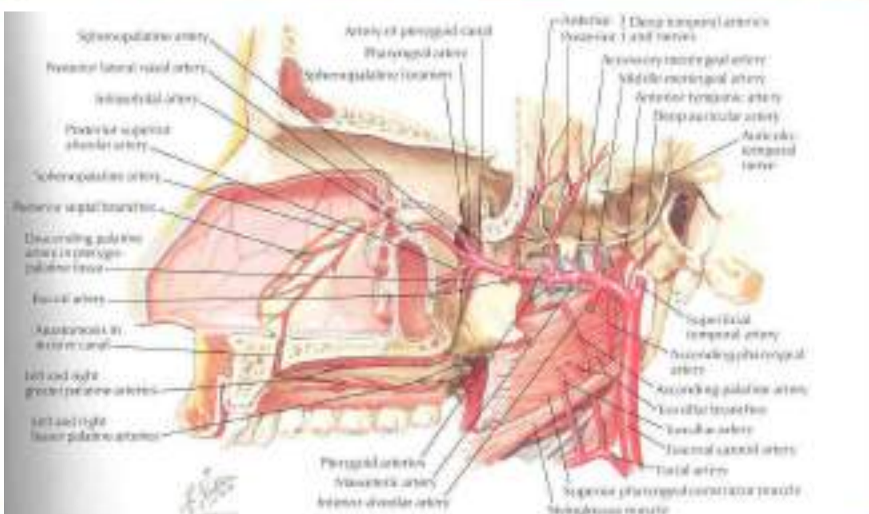
Blood Supply



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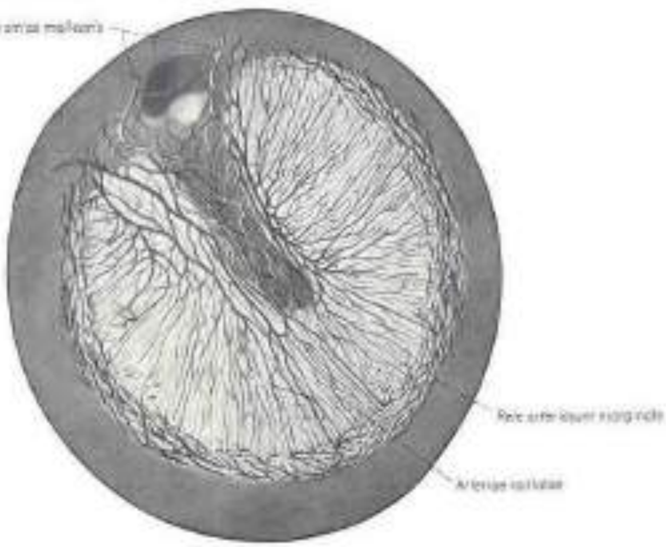
Anatomy



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Physiology of the TM

- Middle ear
  - Transforms air waves to fluid waves
  - Two mechanisms
    - Area affect of TM
      - TM area:foot plate area – 17:1
    - Lever action of the ossicles
    - 1.3:1 malleus to incus ratio
    - 22:1 combined transformer ratio of middle ear
    - Translates to 25 dB

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Physiology of hearing with TM perforations

- Effects on hearing
  - Decreased transformer ratio
  - Round window stimulation causes inner ear fluid waves that cancel out those at the oval window
  - Sound pressure entering the perforation acts on the medial surface of the TM against that on the lateral surface

Etiology of TM p[illegible]

- Infection – most common cause
  - Bacteria
  - Mycobacterium
  - Viruses

Etiology of TM perforations

- Trauma
  - Penetrating trauma
    - Self induced with cue tip most common penetrating cause
  - Blunt
    - Temporal bone fractures
      - Longitudinal fractures more common than transverse fractures
    - Slap injury

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Etiology of TM p[illegible]

- Trauma
  - Thermal
    - Welders and steelworkers
    - Lightning
  - Barotrauma
    - Cadaver studies – 14-33 lbs/in^2
    - Keller (1958) – 195-199 dB sound pressure
  - Iatrogenic
    - Retained ventilation tube

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Etiology of TM perforations

- Traumatic TM perforations
  - 1992 – Kristensen
    - 80% heal spontaneously
    - Thermal injuries 40% heal spontaneously
    - Other negative factors
      - Age > 30 years
      - Large kidney bean shaped central perforations
      - Posterosuperior perforations
      - Infection

Preoperative Evaluation

- History
  - Hearing loss
  - Tinnitus
  - Vertigo
  - Otalgia
  - Otorrhea
  - Facial paralysis
  - Prior otologic procedures
  - Medical history – heart, lung, kidney, liver

Indications for Surgery

- Conductive hearing loss due to TM perforation or ossicular dysfunction
- Chronic or recurrent otitis media secondary to contamination
- Progressive hearing loss due to chronic middle ear pathology
- Perforation or hearing loss persistent > 3 months due to trauma, infection, or surgery
- Inability to bathe or participate in water sports safely

Goals of Surgery

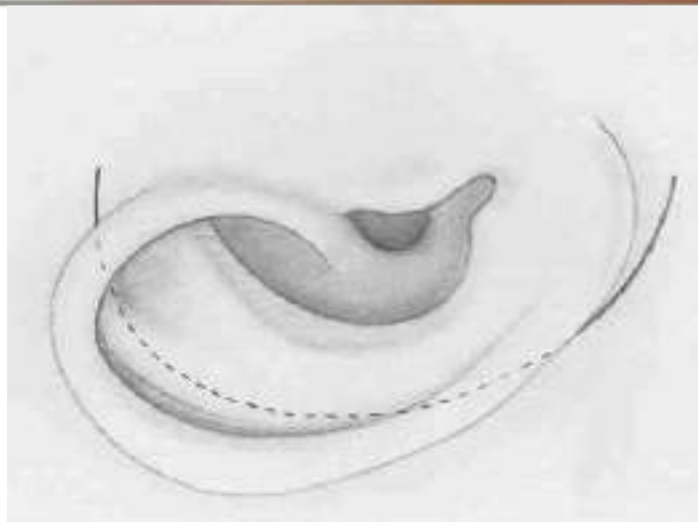
- Establish an intact TM
- Eradicate middle ear disease and create an air-containing middle ear space
- Restore hearing by building a secure connection between the ear drum and the cochlea

Techniques

- Overlay technique (lateral grafting)
- Underlay technique (medial grafting)

Lateral Grafting

Postauricular incision



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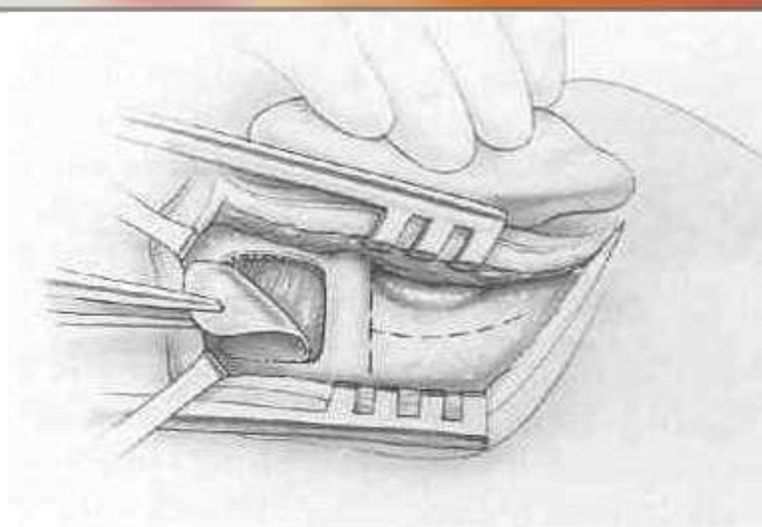
Harvest of temporalis Fascia Graft



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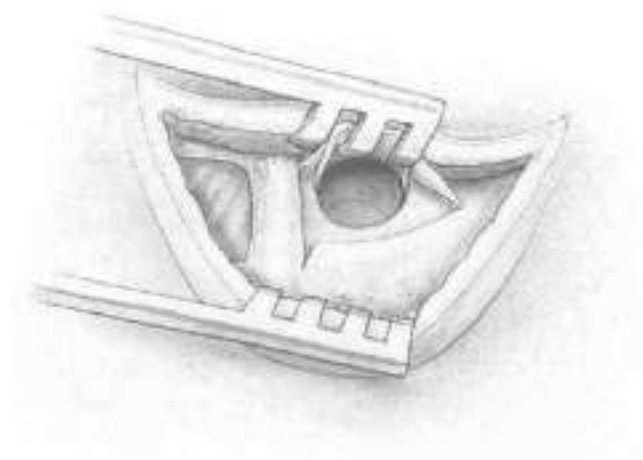
Elevation of the vascular strip



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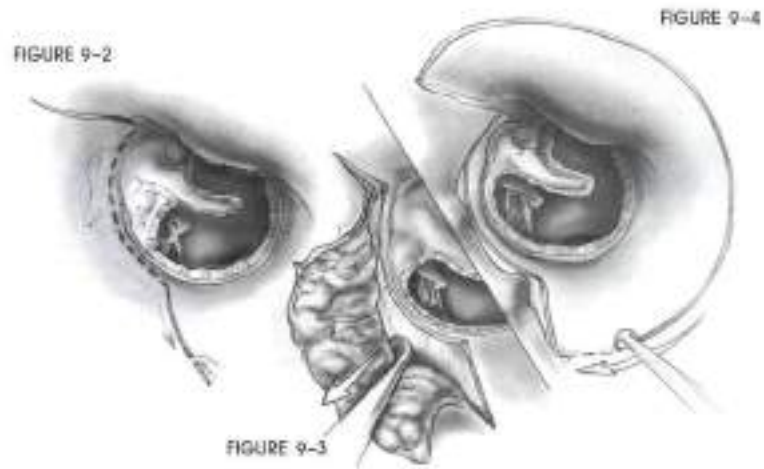
Lateral Grafting



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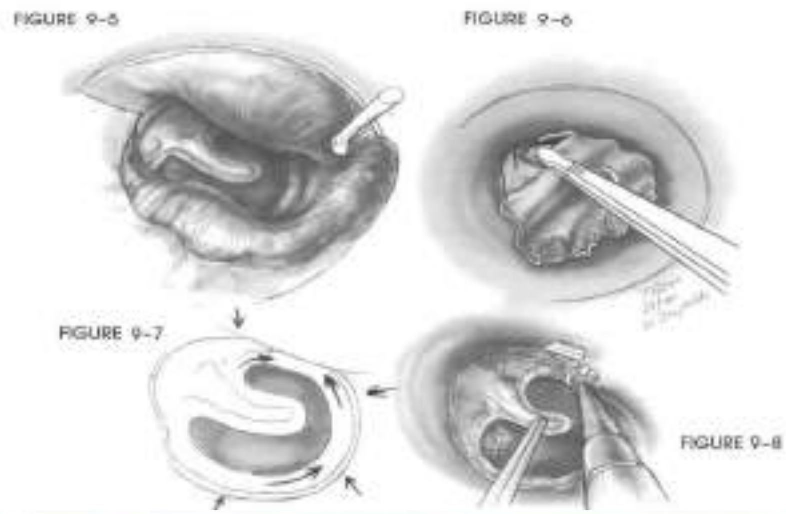
Removal of canal and TM skin
Drilling the anterior canal bulge



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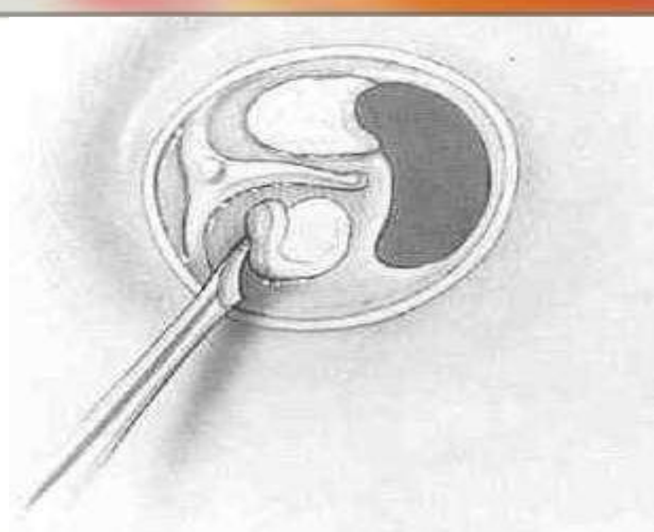
Ensure complete removal of TM epithelium



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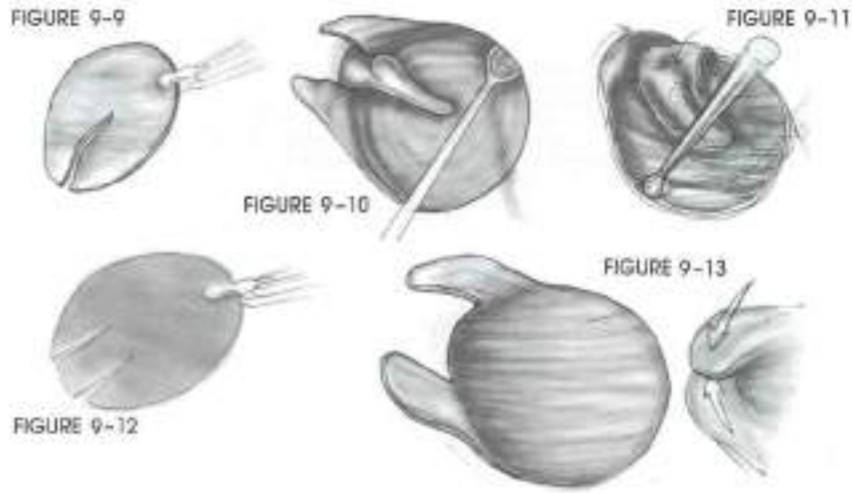
Shaping the fascia graft



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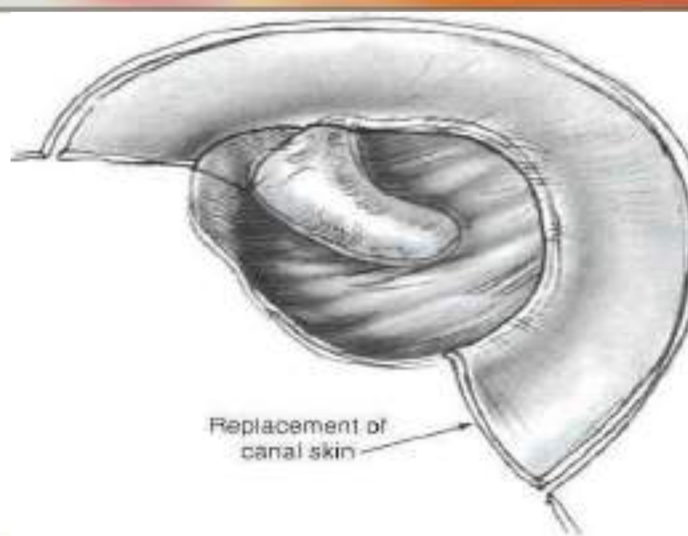
Replacing the canal skin



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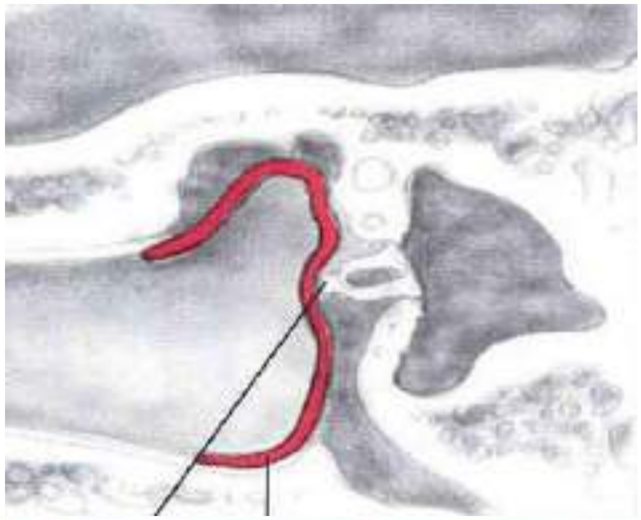
Classification of Tympanoplasty

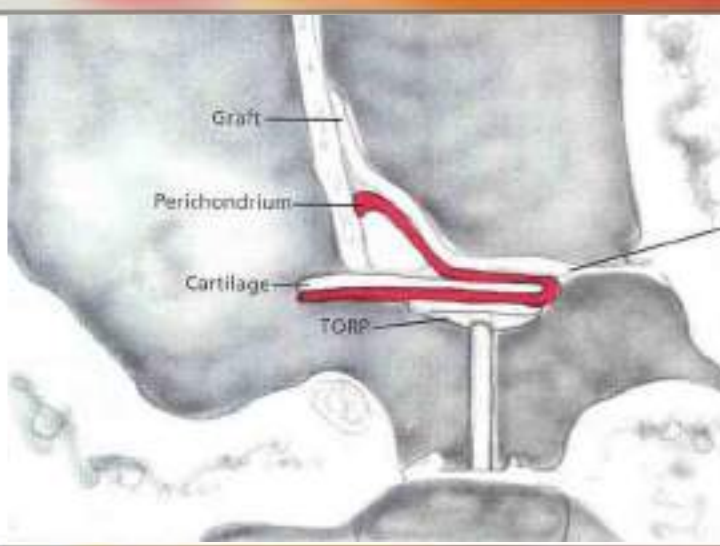
- Wullstein (1956)
  - Type I tympanoplasty
    - TM is grafted to an intact ossicular chain
  - Type II tympanoplasty
    - Malleus is partially eroded
    - TM +/- malleus remnant is grafted to the incus
  - Type III tympanoplasty
    - Malleus and incus are eroded
    - TM is grafted to the stapes suprastructure

- Wullstein classification continued…
  - Type IV tympanoplasty
    - Stapes suprastructure is eroded but foot plate is mobile
    - TM is grafted to a mobile foot plate
  - Type V Tympanoplasty
    - TM is grafted to a fenestration in the horizontal semicircular canal
  - Classification does not take into account middle ear pathology

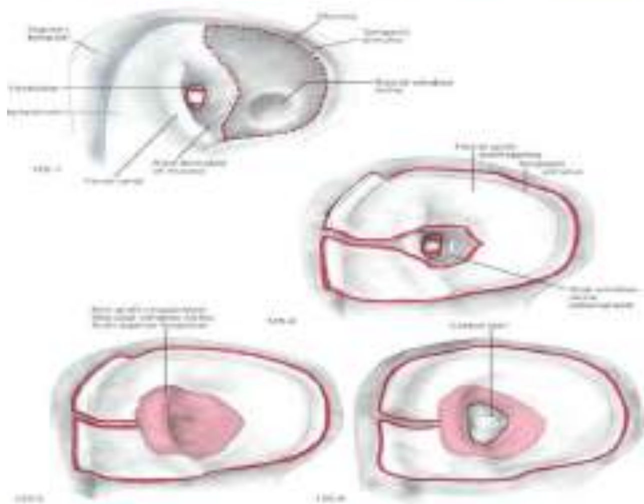
Type III Tympanoplasty



TORP using cartilage stiffener



Type IV Tympanopasty



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Classification of Tympanoplasty

- Belluci
  - Proposed a dual classification
  - Added status of middle ear
    - Group I – Dry ear
    - Group II – Occasional drainage
    - Group III – Persistent drainage with mastoiditis
    - Group IV – Persistent drainage and nasopharyngeal malformation (cleft palate and choanal atresia)

 40

Classification of Tympanoplasty

- Austin's classification
  - Describes the residual ossicular remnants
    - (M+/I+/S+) – intact ossicular chain
    - (M+/S+) or (M+/S-) – good prognosis
    - (M-/S+) or (M-/S+) – poor prognosis
    - M – malleus
    - S – stapes
    - I - incus

Tympanoplasty in Children

- Manning
  - 78% success
- Deskin and Vrabec (1999)
  - Meta-analysis of all common variables assoc. w/ success
  - Found only advancing age was statistically associated with improved outcomes.

Conclusion

- Tympanoplasty has a high rate of success in closing tympanic membrane perforations and improving hearing
- Patients should be chosen carefully based on the indications discussed and attempts at attaining a dry ear prior to surgery should be made

Conclusion

- Patients should be thoroughly counseled preoperatively about the expectations and goals of the surgery
- Tympanoplasty in the pediatric age group is controversial
- Both underlay and overlay techniques for grafting are effective, however, the surgeon should do what he/she is most experienced and successful with.

Chapter 21: Cochlear Implants

Chapter #21

Cochlear Implants

 1

Credit

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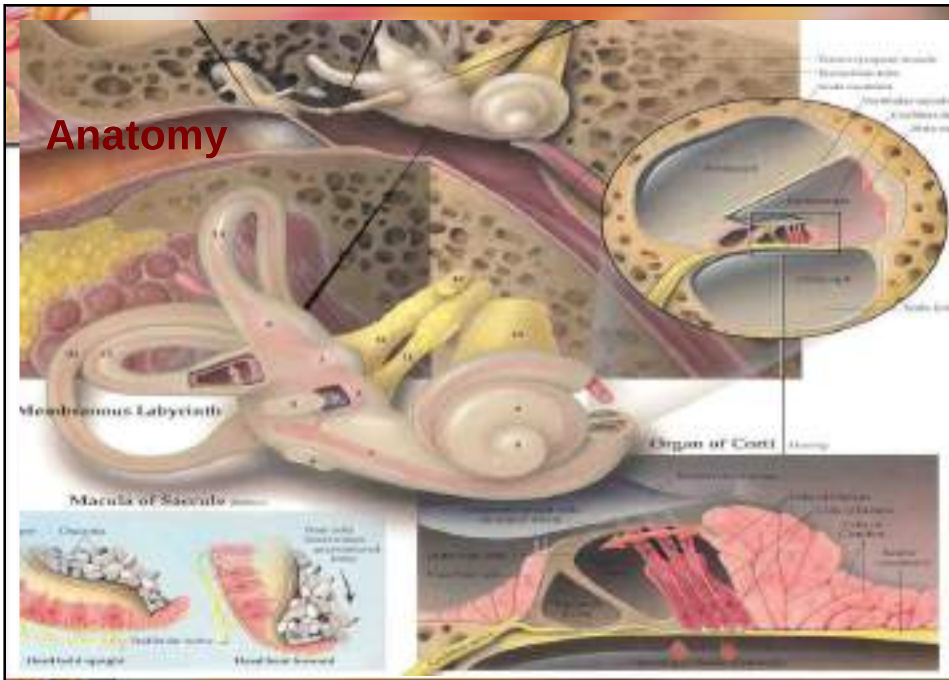
Galveston, TX

 2

History of Cochlear Implants

- Volta
- Djourno and Eyries
- House, Doyle, Simmons
- 1972 Single-channel implant
- 1984 FDA approval
- 1990's
- Beyond

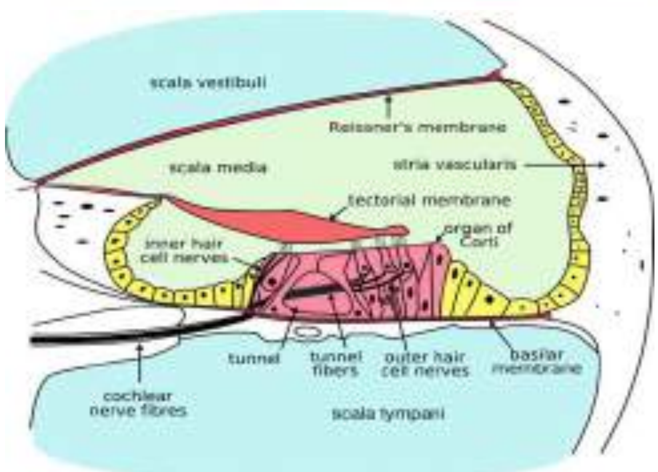
Anatomy



Supportive Cells

- Hensen cells: tall supporting cells constituting the outer border of the organ of Corti.
- Deiter's cell: pharyngeal supporting cell.

5



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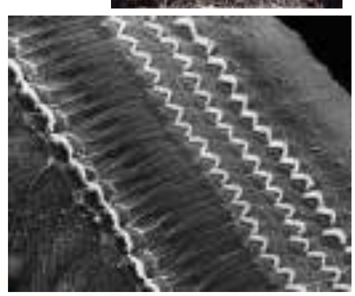
Anatomy

- Scala tympani
- Scala vestibuli
- Cochlear duct
- Basilar membrane
- Vestibular membrane
- Tectorial membrane
- Hair cells (outer/inner)
- Cochlear nerve fibers

 7

Anatomy-



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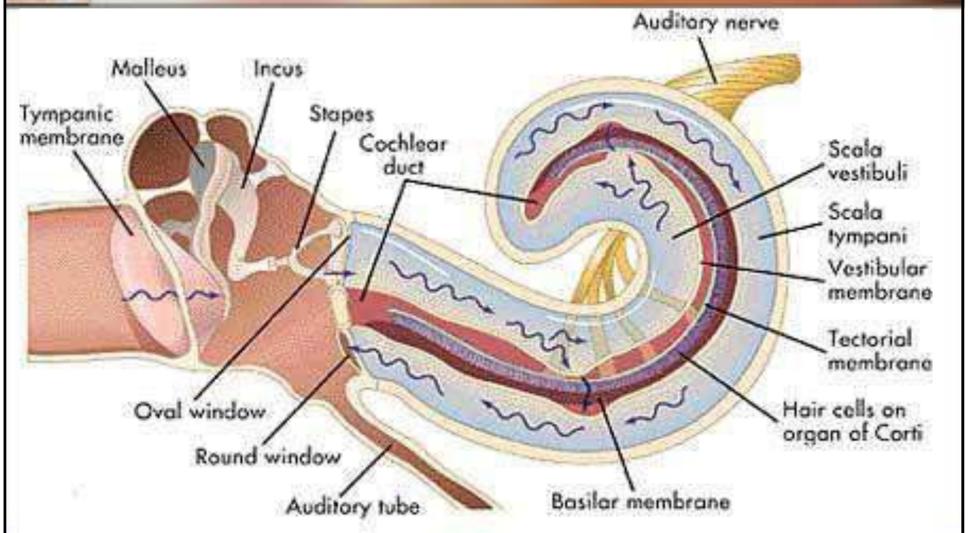
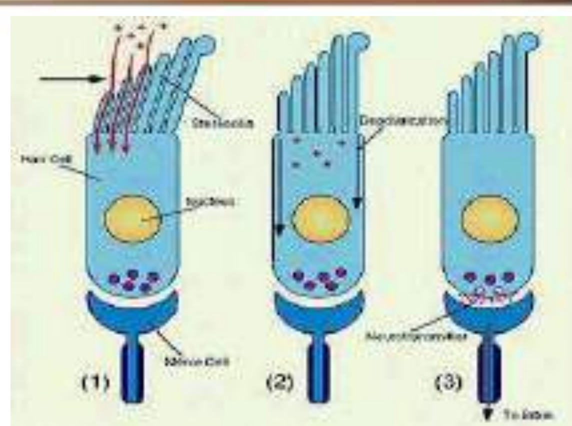
Physiology of Hearing





Anatomy

 11

Sensorineural Hearing Loss

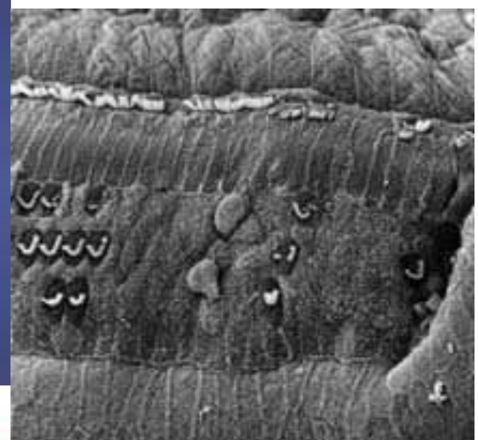
Death of hair cells vs. ganglion cells

Otte, et al estimated we need 10,000 ganglion cells with 3,000 apically to have good speech discrimination

Apical ganglion cells tend to survive better (acoustic trauma)

 12

Pathologic Anatomy

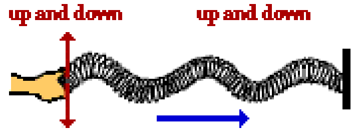


Anatomy of Sound

A vibrating tuning fork will force air within a pipe to begin vibrating back and forth in a direction parallel to the energy transport; sound is a longitudinal wave.

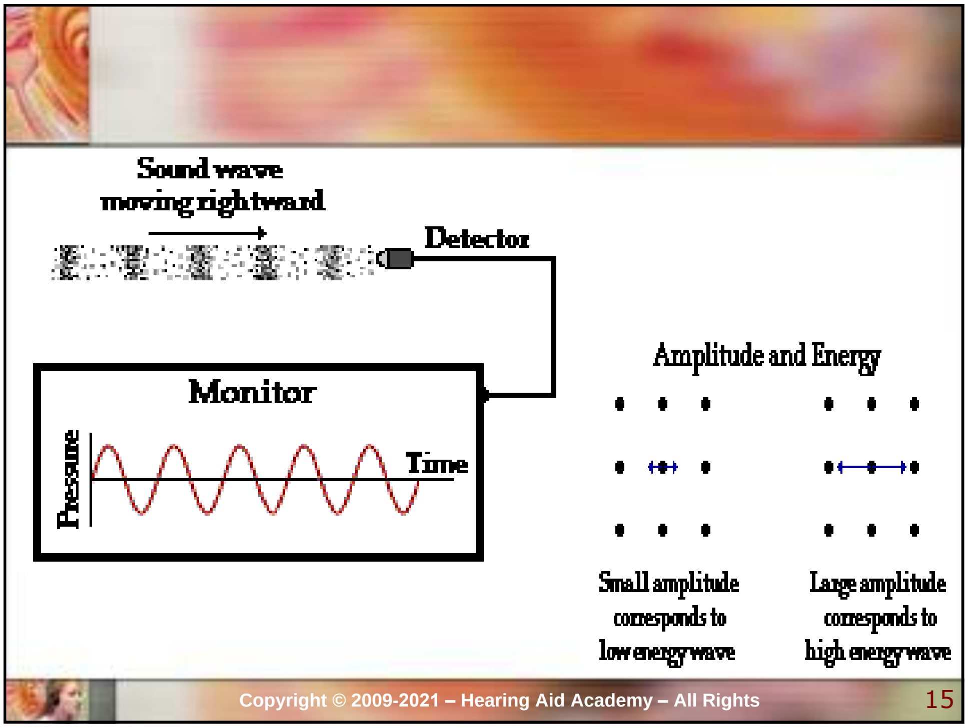
Longitudinal wave		Transverse Wave	
Source moves left and right	Coils move left and right	Source moves up and down	Coils move up and down

Energy Transport



Energy Transport

The subsequent direction of motion of individual particles of a medium is the same as the direction of vibration of the source of the disturbance.


Sound wave
moving rightward
Detector
Monitor
Pressure
Time
Amplitude and Energy
Small amplitude
corresponds to
low energy wave
Large amplitude
corresponds to
high energy wave
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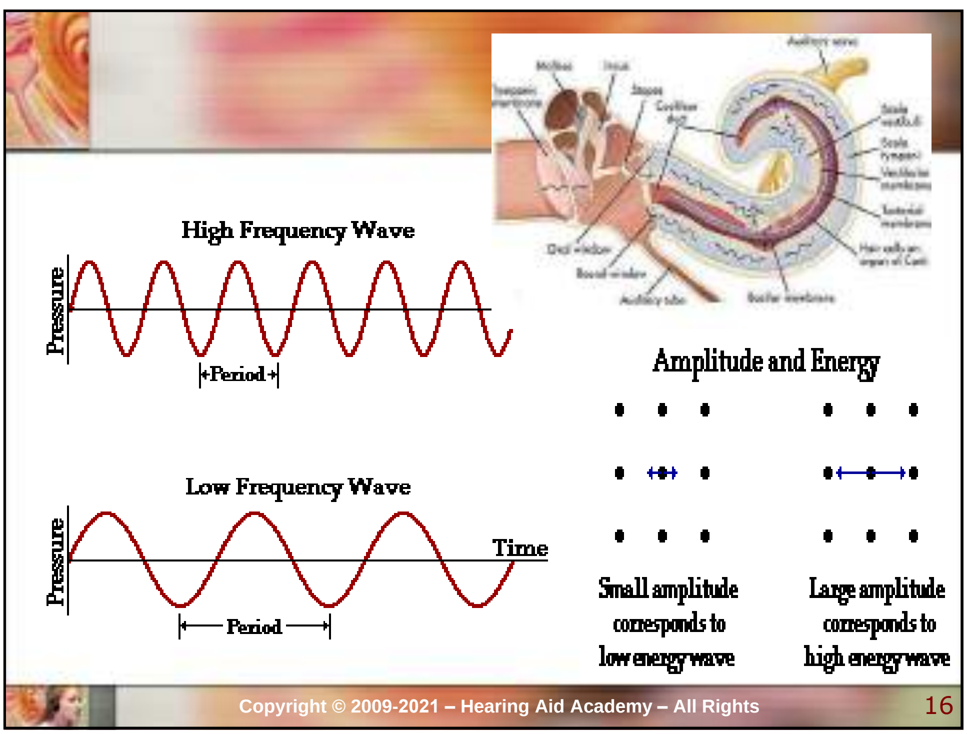
High Frequency Wave
Pressure
Period
Low Frequency Wave
Pressure
Time
Period
Amplitude and Energy
Small amplitude
corresponds to
low energy wave
Large amplitude
corresponds to
high energy wave
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Anatomy of Speech

- Mix of frequencies
- Speech recognition is “top-down” process
- Formant frequencies: frequency maximum based on vocal tract
- F0 is fundamental frequency
- F1 & F2—contribute to vowel identification
- F4 & F5—higher frequency speech sounds
- Some speech based on amplitude—k, f, l, s

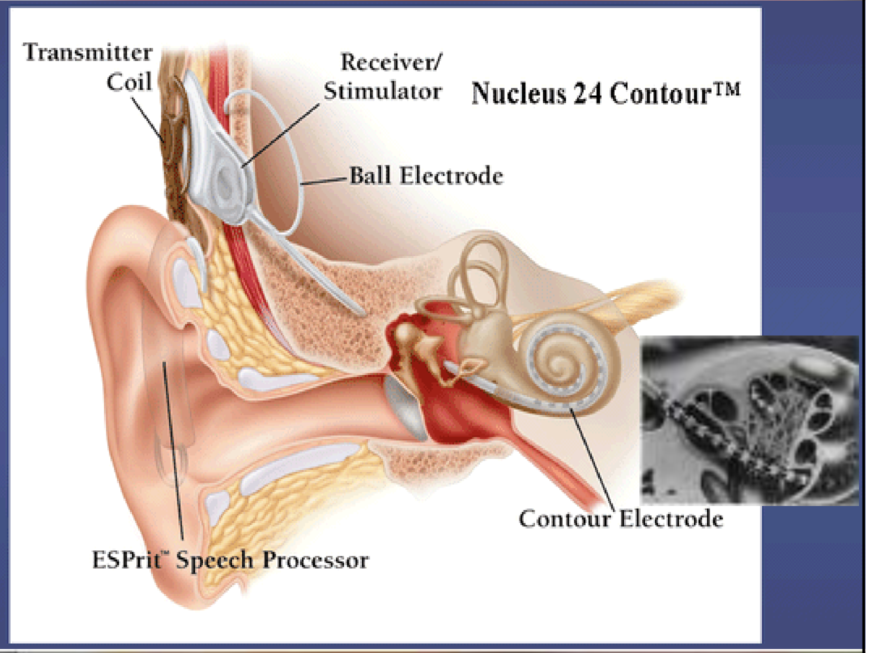
Components of Cochlear Implant

Implant Components

- Microphone
  - amplification
- External speech processor
  - Compression
  - Filtering
  - Shaping
- Transmitter (outer coil)
- Receiver
- Electrode array
- Neural pathways

Types of Cochlear

- Single vs. Multiple channels
  - Audio example of how a cochlear implant sounds with varying number of channels
- Monopolar vs. Bipolar
- Speech processing strategies
  - Spectral peak (Nucleus)
  - Continuous interleaved sampling (Med-El, Nucleus, Clarion)
  - Advanced combined encoder (Nucleus)
  - Simultaneous analog strategy (Clarion)



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Indication for Cochlear Implant

- Adults
  - 18 years old and older (no limitation by age)
  - Bilateral severe-to-profound sensorineural hearing loss (70 dB hearing loss or greater with <u>little</u> or no benefit from hearing aids for 6 months)
  - Psychologically suitable
  - No anatomic contraindications
  - Medically not contraindicated

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Indications for Cochlear Implantation in Children

- 12 months or older
- Bilateral severe-to-profound sensorineural hearing loss with PTA of 90 dB or greater in better ear
- No appreciable benefit with hearing aids (parent survey when <5 yo or 30% or less on sentence recognition when >5 yo)
- Must be able to tolerate wearing hearing aids and show some aided ability
- Enrolled in aural/oral education program
- No medical or anatomic contraindications
- Motivated parents

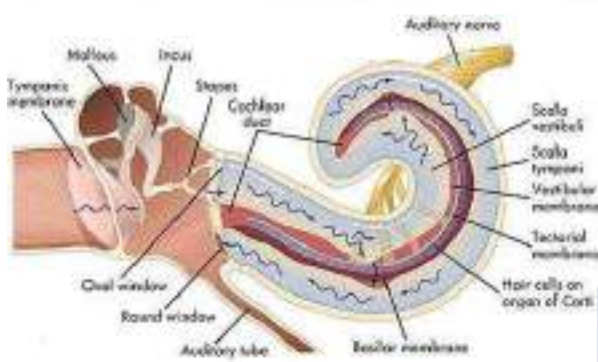
Contraindicatio

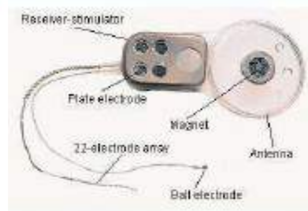
- Incomplete hearing loss
- Neurofibromatosis II, mental retardation, psychosis, organic brain dysfunction, unrealistic expectations
- Active middle ear disease
- CT findings of cochlear agenesis (Michel deformity) or small IAC (CN8 atresia)
- Dysplasia (abnormal cells) not necessarily a contraindication, but informed consent is a must
- H/O CWD mastoidectomy
- Labyrinthitis ossificans —follow scans
- Advanced otosclerosis

General Workup

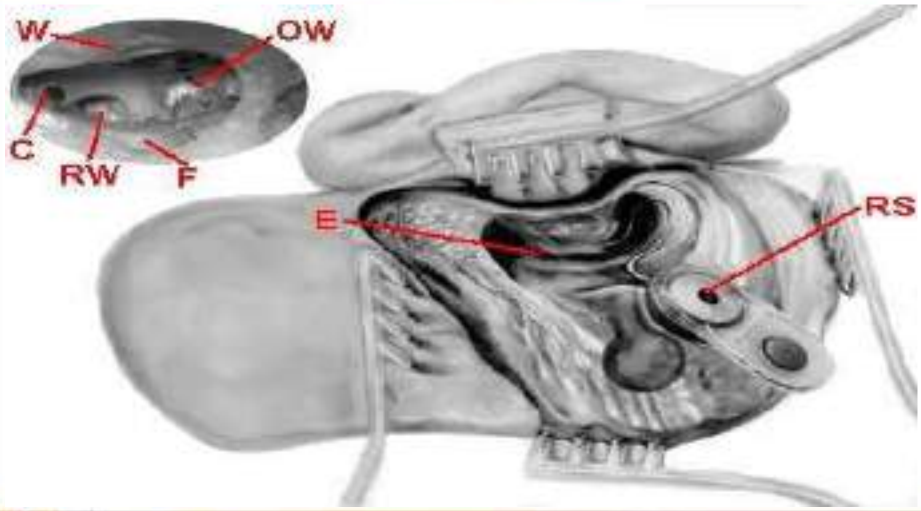
- Audiologic exam with binaural amplification
- CT scan/MRI of temporal bones
- Trial of high-powered hearing aids
- Psychological evaluation
- Medical evaluation
- Any necessary tests to discover etiology of hearing loss

Surgical





Surgical Technique



 27

Postoperative Management

- Complication rate only 5%
- Wound infection/breakdown
  - Yu, et al showed good response to Abx, I&D
- Facial nerve injury/stimulation, CSF leak, Meningitis
  - CDC recommendations
- Vertigo (Steenerson reported 75%)
- Device failure—re-implantation usually successful
- Avoid MRI

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Postoperative Rehabilitation

- Necessary part of implantation
- Different focus depends on patient’s previous experience with sound
- Goal is to enable children to be able to learn passively from the environment
- Program addresses receptive as well as expressive language skills
- Multidisciplinary, dedicated group necessary

Results of Implantation

- Wide range of outcomes
- Improvement is long-term (Waltzman, et al. 5-15 yr f/u)
- Implantation is cost effective—even in the elderly (Francis, et al)
- Research indicates recipe for success includes:
  - Short length of time from deafness to implantation (Sharma showed <3.5 years regain normal latencies within 6 mos. After 7 years, little plasticity remains)

Results of Implantation

- Experience with language before onset of deafness
- Implantation before age six for prelingually deafened children (Govaerts, et al showed 90% of children implanted <2yo were integrated into mainstream vs. only 20-30% if implanted after age 4)
- Aural/oral education
- Highly motivated patients/parents

A Look to the

- Partial implants with hearing aid
  - Those with residual low-frequency hearing
- Intraoperative mapping
- Bilateral implantation
  - One vs. two speech processors
- Implantation for asymmetric SNHL
- Minimally invasive implantation

Chapter 22: Putting it all together

Chapter #22

Putting It All Together

What is Expected

1. You must be familiar with your equipment.
2. Your equipment must be in excellent working order.
3. Lack of equipment, required supplies, and valid certification will mean that you don't take your exam.

What is Expected

- 4. Your audiometer and sound field meter must be calibrated within one year of your exam. You must present your calibration certificates to your examination supervisor.

- 5. Along with all of the expected materials, you must have phonetically balanced and spondee word lists in order to record SRTs and SDS.

What is Expected

- 6. Unless your state indicates otherwise, you must bring your own equipment and audiograms to the examination.

Take Along Checklist

1. Audiometer (w/manual setting)
2. Audiometer calibration sheet
3. Sound Level Meter (must measure down to 42 dBA (A scale)
4. Sound Level Meter certificate
5. Sound Field Speaker
6. Headphones (or inserts) [Attenuation]

Take Along Checklist

- 7. Bone Oscillator (how do you hold it?)
- Weber Test
- 8. Recorded Speech Material
- 9. All of your cords (don't forget your indicator button)
- 10. Otoscope & Earlight
- 11.New Specula (more than one!!)
- 12. Otoblocks (foam and cotton)
- Leave them untied. . .

Take Along Checklist

- 13. Hand Disinfectant.
- 14. Handi-wipes.
- 15. Clean white towel or paper towels to preserve cleanliness on your surface.
- 16. Syringe or Impression gun.
- 17. Two or three unused nozzles.
- 18. Two sets of impression materials.

7

Tips

1. During your practical exam, do not speak until you are facing your examiner.
2. Do not speak until you have eye contact.
3. Treat your examiner as if he or she has hearing loss. Speak clearly and distinctly. Maintain a level speaking volume at all times during exam.

8

Tips

- 4. Tell your examiner what you are going to do before you do it.
- 5. Tell your examiner what you are doing while you are doing it.
- 6. When you are finished, tell your examiner what you have done.
- 7. Be prepared to critique your own ear impression.

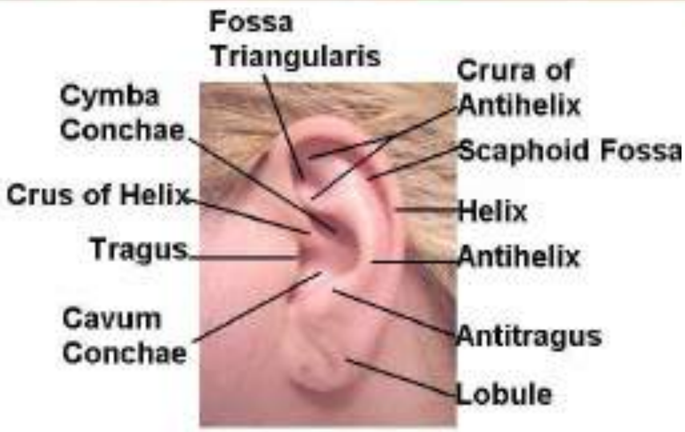
9

Tips

- 8. If you determine that you have taken a poor impression, tell your examiner that you are not satisfied with this impression because . . . [be anatomically correct and specific] and ask to take a second impression (unless your testing procedure won't allow it).
- 9. Remember your anatomy!!
- 10. Remember your Red and Blue pens.

10

Remember your EAR



Anatomy of the Pinna

Set-Up

1. Set up as though you are in your own clinic. Be NEAT.
2. As you set up your audiometer, perform a bio-acoustic test in front of your examiner (Listen to the tones). When finished, say, "Good to go." or something to affirm that you are satisfied despite what the calibration certificate shows.

Set-Up

- 3. Only set up your otoscopy equipment if you are taking the impression at the same location as where you perform the audiometric battery. Be aware of things like these when you enter the exam site.
- 4. Take your time when you set up. Let the examiner see you demonstrate care and cleanliness.
- 5. Smile and take calm, deliberate steps.

Set-Up

- 6. Practice this at home or in the office if you already are testing in a private office.
- 7. Create your lists. Enjoy the critiques because they will help you own better and better technique.
- 8. As your examiner notices your efficient and proper technique, you will gain momentum. It's yours to pass!

Otoscopy

1. After you have set up, listen carefully to your instructions.
2. When you are given the go-ahead, pick up your otoscope and screw on a speculum using clean technique.
3. Explain what you are going to do while the otoscope is in your hand. Get comfortable with it. “I am going to check to make sure that . . .”

Otoscopy

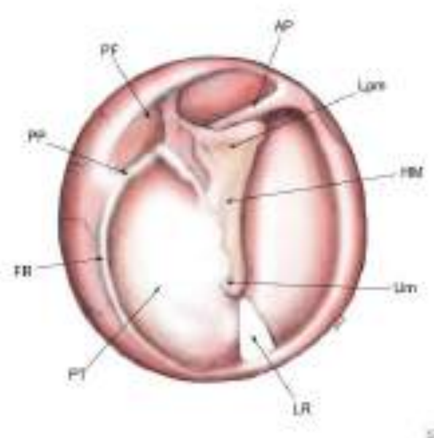
- 4. Explain bracing and what you want to discover.
- 5. “I am going to position your head so that I can see easily!” Gentle but firmly, angle the head.
- 6. Lift the top of the helix with your free hand and insert the otoscope.
- 7. BRACE.

Otoscopy

- 8. Look for the second bend while you inspect the ear. This may be the ear that you create an impression from.
- 9. Describe the health of the canal.
- 10. Be prepared to answer questions about it.
- 11. Describe the TM in anatomical terms.

Remember your ANATOMY

1. Pars tensa (PT)
2. pars flaccida (PF)
3. light reflex (LR)
4. fibrous ring (FR)
5. umbo (Um)
6. handle of malleus (H
7. lateral process of malleus (Lpm)
8. anterior plica (AP)
9. posterior plica (PP)



Remember your Red Flags

1. Visible deformity in the outer ear
2. Visible evidence of cerumen impaction or significant accumulation or lodged foreign body within the ear canal
3. History of active drainage (otorrhea) within 90 days
4. History of sudden onset of hearing loss within 90 days

Remember your Red Flags

- 5. Acute or chronic (persistent and lasting) symptoms of dizziness
- 6. Onset of monaural (one ear) hearing loss of a duration of 90 days or less
- 7. Pain or discomfort within the ear
- 8. Gap of more than 15 dB between air and bone conduction at 500 Hz, 1000 Hz, and 2000 Hz

Air Conduction

1. Unmasked pure tones
2. Test and compute PTA
3. Use correct symbols
4. Test with masking using plateau technique.
5. Make certain that your instructions are simple and direct. You are speaking to someone with hearing loss!

Bone Conduction

1. Use Weber test to determine which ear to test first or examine your AC audiogram.
2. Don't forget your instructions! "This test helps me to understand what kind of hearing loss you may have."
3. You will test unmasked and masked.
4. Remember not to let the headsets touch the BC band.

Speech Audiometry

1. Determine Speech Reception Threshold.
2. You may test unmasked or masked or both.
3. Determine MCL – most comfortable level. First test each right ear. Then test binaurally. Binaural MCL should be less than the individual scores.

Speech Audiometry

- 4. Test for discomfort levels. Two terms are used: LDL (loudness discomfort level) and UCL (uncomfortable level)
- 5. Explain the reasons for these tests before you begin.
- 6. Perform Speech Discrimination Score (or Word Discrimination Score).
- 7. You may perform these tests unmasked or masked.

Sound Field Audiometry

1. Set up and calibrate equipment.
2. Perform unaided SRT.
3. Perform Speech Discrimination.
4. Perform aided SRT.
5. Perform aided Speech Discrimination.

Earmold Impression

1. Preparation
2. Cleanliness
3. Instructions
4. Otoscopic Inspection
5. Oto-block selection
6. Tie your knot
7. Placing the Block

Earmold Impression

- 8. Block Placement with Bracing
- 9. Verification
- 10. Insert Mixing Tip
- 11. Insert impression material into gun
- 12. Insert gun tip into canal.
- 13. Inject impression material.
- 14. Set timer.
- 15. Remove impression.

Earmold Impression

- 16. Immediately place impression on sanitary counter and re-examine ear.
- 17. Critique your own impression.

Air Conduction Masking Review

- When?
- When air conduction threshold of TE and NTE differ by 40 dB or more.
- Or
- When AC threshold of TE and BC threshold of NTE differ by 40 dB or more.

Procedure

1. Choose initial level for NTE: NTE air conduction threshold plus 15 dB.
2. Re-establish threshold.
3. After each positive response, increase masking by 5 dB.
4. Each time Pt does not respond, increase signal by 5 dB until you get a positive response.

Procedure

- 5. Continue until you increase masking in 5 dB steps without a shift in the threshold. This is your plateau.
- 6. Record the masked Threshold and the final masking level on your audiogram.

Bone Conduction Masking Review

- When?
- When unmasked bone conduction responses are not symmetric.
- When AC of NTE and BC threshold differ by more than 10 dB.

Procedure

1. Obtain BC threshold in TE with NTE unoccluded.
2. Choose initial level of masking for NTE: NTE air threshold at that frequency, adding 15 dB. Reestablish threshold.
3. After each positive response, increase masking by 5 dB.
4. Each time Pt does not respond, increase signal by 5 dB until you get a positive response.

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Procedure

- 5. Continue until you increase masking in 5 dB steps without a shift in the threshold. This is your plateau.
- 6. Record the masked Threshold and the final masking level on your audiogram.

 34

WHAT, if anything?

- Did I leave out?

- ?
- ?
- ?

What if you're asked

- Questions about taking a case history?

Well,

- Have you noticed difficulty with your hearing?
- For how long?
- When do you think the hearing loss began?
- Has your difficulty with hearing been gradual or sudden?
- Do you hear more clearly in one ear or are they both about the same?

More

- Are you taking any medications?
- Have you ever had surgery on either of your ears?
- Do your ears ring or do you hear other sounds in your ears such as buzzing or whistling?
- Have you had a recent ear infection?
- Do you ever get dizzy?

More

- Are certain voices more clear than others?
- Are certain sounds more clear than others?
- Do other people in your family have hearing loss?
- How do you deal with this in your life?
- Does he/she complain that you like the

More

- TV up too loud for comfortable listening?
- Do you ask others to repeat what they've said so you get a second chance to understand?
- Is listening in noisy places stressful?
- What type of work have you done in your life?
- Do you hear alright but have difficulty

More

- understanding?
- What motivated you to come here today?
- Red Flag, red flag, red flag. . .

Chapter 23: Competency Building #2

Chapter #23

Competency Building #2

1) Which of the following would not be a common earmold "physical difference" option?

- A. canal-lock earmold
- B. shell earmold
- C. semi-skeleton earmold
- D. pinna earmold

2) Which of the following would not be considered a non-occluding earmold?

- A. Non-vented shell earmold
- B. CROS earmold
- C. High frequency earmold
- D. IROS earmold

 3

3) To decrease high frequencies for those persons with rising audiograms, the sound channel of the earmold should be:

- A. Relatively large in diameter
- B. Relatively short in length
- C. Relatively small in diameter
- D. All of the above

 4

4) A longer canal on an earmold:

- A. is used only on very long canals
- B. enhances high frequencies
- C. enhances low frequencies
- D. always comes with a small pressure vent

 5

Question #5

-
- 5) With normal hearing up to 2000 Hz, then dropping sharply to 45 dB at 3000 Hz and 60 dB at 4000 Hz, what earmold style would be the most appropriate in a BTE fitting:

- A. shell
- B. standard or regular with tubing
- C. non-occluding
- D. receiver mold

 6

6) If a patient has a hearing loss much greater in the higher frequencies, it would be advised to order an earmold with:

- A. small pressure vent
- B. a very large diameter sound channel
- C. a very long canal
- D. a very small diameter sound channel

7) In a non-occluding earmold, the effect on the low frequencies (below 750 Hz) would be:

- A. moves peak to higher frequency
- B. negligible
- C. decreases
- D. increases peak height

8) Placing an earmold in the ear canal will:

- A. result in the "tin ear effect"
- B. enhance the "horn effect"
- C. eliminate the natural ear canal resonance
- D. enhance the natural ear canal resonance

9) A larger bore diameter through an earmold canal I what effect on frequencies above 3000 Hz:

- A. negligible
- B. increases
- C. decreases
- D. moves peak to a lower frequency

10) What effect does smaller diameter tubing have on high frequencies above 3000 Hz?

- A. moves peak to higher frequency
- B. negligible
- C. decreases

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11) What effect does a longer canal have on low frequencies below 750 Hz?

- A. moves peak to higher frequency
- B. decreases
- C. increases
- D. negligible

 12

12) A 64dB gain BTE with an output of 124 dB SSPL-40 would use which of the following type of earmold:

- A. shell
- B. IROS
- C. HF
- D. a "B" style modification

13) What is the use for a libby horn?

- A. give the patient more power with high frequencies added
- B. give the patient only more power
- C. give the patient only high frequencies
- D. give the patient lower power

14) Which is a non-occluding earmold?

- A. free field
- B. soft
- C. receiver
- D. shell

15) What is the effect of a larger bore above 3000?

- A. gives no help at all
- B. gives the same effect as a reverse libby horn
- C. gives more highs
- D. gives equal amount of help at all frequencies

16) What consideration must be given when otitis media is present? What earmold is used?

- A. soft to make it easier to take out and in
- B. hard lucite with a pressure vent
- C. soft to hold in the drainage
- D. hard lucite with a canal or "V" type of vent

17) Which earmold is used for a high frequency loss?

- A. shell made of soft material
- B. non occluding made of hard lucite
- C. standard made of hard lucite
- D. all of the above

18) Why use a short canal?

- A. to give more mid frequencies
- B. to give less high frequencies
- C. to give more low frequencies
- D. to give more high frequencies

19) What is used in the good ear in a CROS fitting?

- A. shell type mold with short canal
- B. receiver type mold with long canal
- C. skeleton type of mold with long canal
- D. non occluding mold with short canal

20) What is the effect below 750 Hz when a non-occluding earmold is used?

- A. gives same amplification as above
- B. gives no amplification
- C. gives greater amplification
- D. none of the above

22) BTE earmold used for normal hearing to 1000 Hz and a ski slope loss at 4000 Hz:

- A. regular fitting with T-22 receiver
- B. lucite with a short canal and IROS "A" vent
- C. soft with a long canal
- D. lucite with a long canal and reverse IROS "A"

23) What is the effect of a long canal when used below 750 Hz?

- A. takes away the highs
- B. gives more highs
- C. takes away the lows
- D. gives more lows

 23

24) If you have an BTE with an HFA SSPL 90 of 117 dB, a frequency range of 140-5600 Hz and an HFA FOG gain of 46 dB, this would be for a:

- A. Moderate HF sensonineural loss
- B. Mild HF sensorineural loss
- C. Severe HF sensorineural loss
- D. Severe sensorineural loss

 24

25) Which is used with a high frequency loss?

- A. Long canal
- B. Small diameter sound channel
- C. Large diameter sound channel
- D. Small pressure vent

26) When fitting a patient with a draining ear you should consider this type of vent:

- A. pressure
- B. V, U, or canal
- C. medium
- D. none would be needed

27) When fitting a patient with a PTA greater than 70 dB the best type of mold is:

- A. soft material with a long canal and no vent
- B. soft material with a short canal and IROS vent
- C. lucite material with a short canal and no vent
- D. all of the above

28) When you are fitting a patient who needs a body instrument, the best type of mold is:

- A. shell
- B. skeleton
- C. shell canal
- D. receiver with a snap ring

29) A tube fitting could be used for what type of hearing loss?

- A. moderate
- B. CROS
- C. profound
- D. none of the above

30) A long canal with a medium parallel vent is used for what type of hearing loss?

- A. near normal / mild
- B. profound
- C. moderate/sever
- D. moderate

31) If a patient comes into your office with an audiogram showing a sensorineural PTA of 45 dB AD and 70 dB AS and complaining of being dizzy with a 20 percent difference in SDT scores, what are looking at:

- A. hearing loss caused at birth
- B. hearing loss caused by central problem
- C. hearing loss caused by loud noise
- D. hearing loss caused by otitis media

32) If a patient comes into your office with a audiogram showing a sensorineural PTA 50 dB AU with a rising reverse slope, and reduced SDT scores you are looking at:

- A. hearing loss caused by loud noise
- B. hearing loss caused by otitis media
- C. hearing loss caused by central problem
- D. hearing loss caused by diabetes

33) If a patient comes into your office with a audiogram showing a sensorinenral PTA 50 dB with a sloping configuration and reduced SDT scores you are looking at:

- A. hearing loss caused by old age
- B. hearing loss caused by otitis media
- C. hearing loss caused by central problem
- D. hearing loss caused by loud noise

CB Question #34

- 34) If a patient comes into your office with a audiogram showing a PTA 10 dB L and 40 dB R with a gradual sloping configuration, conductive component and normal SDT scores you are looking at:

- A. hearing loss caused by otitis media
- B. hearing loss caused by central problem
- C. hearing loss caused by loud noise
- D. hearing toss caused by birth

35) If a patient comes into your office with a audiogram showing a PTA 40 dB with a rising reverse rising reverse configuration, conductive component and normal SDT scores you are looking at:

- A. hearing loss caused by loud noise
- B. hearing loss caused by otosclerosis
- C. hearing loss caused by otitis media
- D. hearing loss caused by birth

 35

36) If a patient comes into your office with a audiogram showing a PTA 10 dB L and 50 R with a flat configuration and 2 K 5 dB peak, sensorineural and reduced SDT scores you are looking at:

- A. hearing loss caused by otitis media
- B. hearing loss caused by Meniere's
- C. hearing loss caused by birth
- D. hearing loss caused by loud noise

 36

#37 question

- If a patient comes into your office complaining of having hearing problems in social situations. After you finish with the complete battery, you learn that the patient has a sensorineural hearing loss caused by occupational noise exposure. Your next course of action would include:

#37 answers

- A. medical clearance
- B. fitting of hearing instruments
- C. no need to fit right now, patient should wait till the problem is a little bit worse
- D. both a and b

38) One of the ways to have the hearing instrument response to give a more normal sound to the patient is to:

- A. have the patient to tell you when it gives louder sound
- B. have the patient to tell you when it sounds the way that they want it to
- C. have the patient to tell you when it sounds just like it did before they were fit
- D. have real ear measurement show peak gain of the hearing instrument to be aligned with the open ear resonance of the patient

39) After a complete hearing exam you find that your patient has mild hearing loss (R) and has no residual hearing (L). What is the best type of hearing instrument to fit on your patient?

- A. BiCROS fitting to the right ear
- B. fit only R since it is the ear that can hear the best, with a low power ITC
- C. fit only L since it is the ear that needs it most, with a power BTE
- D. CROS fitting to the left ear

40) You just completed a full hearing evaluation. Your patient states the need a copy to take with him or her, you must:

- A. only have to give a copy if the person being tested pays for the evaluation
- B. only send a copy to the patients doctor
- C. send a copy of the whole file to the patients doctor and give the patient a copy
- D. none of the above

41) When the wind is coming from directly ahead, wind noise is reduced in CIC's by the following amount:

- A. 28 dB
- B. 7 dB SPL
- C. 23 dB
- D. 27 dB

42) All but one of the following are considered possible disadvantages of CIC fittings:

- A. introduction of programmable CIC's
- B. higher return rate
- C. cost
- D. lack of a volume control

43) Earmold impressions for CIC's should:

- A. extend to the second bend with medium viscosity, silicon material
- B. extend at least 2 mm beyond the second bend using medium viscosity, silicon material
- C. extend to the second bend with light viscosity material using foam blocks
- D. extend at least 2 mm beyond the second bend with light viscosity, silicon material

44) With CIC fittings, which of the following frequency modifications should be made?

- A. deletion of automatic gain reduction due to the lack of volume control
- B. less low frequency amplification should be provided due to the small pinhole vent
- C. increased gain due to the difference in ear and 2 cc coupler gain differences
- D. less high frequency amplification should be provided due to the deeper microphone placement

45) The Zeta Noise Blocker was:

- A. an example of a hybrid analog-digital hearing instrument
- B. successful early attempt at digital noise reduction technology
- C. an analog filter placed with a DSP hearing instrument
- D. none of the above

46) The first commercially available Digital Signal Processing hearing instrument:

- A. was developed by Audiotone
- B. was introduced in 1986
- C. had better than average battery life
- D. included a body-worn electronic processor

- 47) A programmable hearing instrument with 4 channels and 1 memory could be considered a__________programmable
- hearing instrument:

- A. class 2
- B. class 4
- C. class 3
- D. class 1

48) In digital signal processing, a set of mathematical steps involving muliplication, addition, and subtraction is referred to as:

- A. binary conversion
- B. imaging
- C. analog to digital conversion
- D. an algorithm

49) The number 512 would have a binary code of:

- A. 1000000000
- B. 100000000
- C. 1111111111
- D. 100000101

50) The sampling rate:

- A. has a direct bearing on the frequency bandwidth of the hearing instrument
- B. must be at least twice as fast as the highest desired frequency
- C. refers to how often the waveform amplitude is measured
- D. all of the above

51) Quantization is related to:

- A. nyquist Theory
- B. aliasing
- C. number of bits
- D. all of the above

52) The number of bits impact the:

- A. range of the hearing instrument transducers
- B. frequency resolution of the hearing instrument
- C. dynamic range of the hearing instrument
- D. digital to analog conversion

53) Imaging occurs during the:

- A. analog to digital conversion stage
- B. digital to analog conversion stage
- C. receiver conversion of the electrical signal to an acoustic signal
- D. signal processing stage

54) Which of the following is not an advantage attributable to digital signal processing in hearing instruments?

- A. implementation of noise reduction and speech enhancement features
- B. ability to use more channels for different types of signal processing
- C. use of active filters for frequency response shaping
- D. all of the above are advantages attributable to digital signal processing

 55

55) When you cup your hand behind the ear, sound:

- A. does not actually increase
- B. increases by 8-10 dB
- C. increases by 5-8 dB
- D. increases by 10-15 dB

 56

56) The first patent for a telephone type hearing instrument was in:

- A. 1930
- B. 1903
- C. 1923
- D. 1892

57) The first electric hearing instrument:

- A. was used by Beethoven
- B. required vacuum tubes
- C. used a bone conduction device
- D. collected and amplified sound

58) The carbon granule microphone:

- A. was invented by Alexander Graham Bell in 1876
- B. caused static and fading with body movement
- C. used a filament that generates heat
- D. became commercially available in the 1950's

59) Desk and suitcase sized hearing instruments, popular in the 1920's, had more gain and clarity because of:

- A. the transistor
- B. vacuum tube amplifiers
- C. magnetic earphones
- D. carbon granule microphones

60) Wearable instruments were a result of:

- A. the miniature vacuum tube
- B. the piezo-electrical microphone
- C. the magnetic microphone
- D. the arrival of the transistor

61) Crystal microphones and receivers:

- A. are very fragile
- B. use a filament that generates heat
- C. work well in high temperatures
- D. couldn't withstand dry conditions

62) A FET changed the high impedance problems of the:

- A. electret microphone
- B. ceramic microphone
- C. magnetic microphone
- D. carbon granule microphone

63) Magnetic microphones:

- A. have a poor response in the extreme highs and lows
- B. have a good frequency response in the speech range
- C. replaced the carbon microphones
- D. have high impedance

64) The miniature vacuum tube was introduced in about:

- A. 1920
- B. 1938
- C. 1948
- D. 1908

65) The three major concepts in the use of electricity are:

- A. current, power and resistance
- B. power, voltage and battery drain
- C. current, sound pressure and resistance
- D. current, voltage and resistance

66) A resistor:

- A. restricts low frequencies
- B. reverses the flow of electrons
- C. restricts high frequencies
- D. restricts the flow of electrons

67) The law that states: “Energy cannot be created or destroyed” is:

- A. the law of electricity
- B. the law of conservation of energy
- C. ohm's law
- D. the law of resistance

68) The following is not a transducer:

- A. telephone coil
- B. microphone
- C. volume control
- D. receiver

69) Electrical energy uses the atom. Atoms:

- A. are electrically neutral
- B. are electrically negative
- C. are electrically positive
- D. orbit around electrons

70) Part of the basic law of electrical energy is:

- A. electrons attract protons
- B. protons repel electrons
- C. protons attract electrons
- D. protons repel neutrons

71) To produce current:

- A. protons move from atom to atom
- B. electrons move from atom to atom
- C. electrons move from neutron to neutron
- D. atoms move from proton to electron

72) A greater flow of current produces:

- A. more volume
- B. more timbre
- C. less intensity
- D. less battery gain

73) Semi-conductors act like a conductor with the application of:

- A. heat, light or an electric field
- B. antimony, phosphorus or arsenic
- C. boron, aluminum or gallium
- D. copper, gold or silver

74) The function of a microphone is to:

- A. convert electrical energy into acoustic energy
- B. convert acoustic energy into electrical energy
- C. amplify the acoustic signal
- D. pick up electro-magnetic signals

75) Coupling in a hearing instrument refers to connecting:

- A. the microphone to the amplifier
- B. solid state materials to create a junction
- C. one stage of an amplifier to the next
- D. the diaphragm of the microphone to the electro-magnet

76) The `T' position on a hearing aid switch can be used to:

- A. couple a hearing aid into a loop inductor system
- B. couple directly into the audio of a radio or TV set with a separate
- C. amplify a telephone conversation
- D. all of the above

77) The following components can change or modify the frequency response of a hearing instrument:

- A. a microphone
- B. a volume control
- C. an output potentiometer
- D. an off switch

78) The following is a transducer:

- A. integrated circuit
- B. electret microphone
- C. amplifier
- D. volume control

79) Hard peak clipping occurs in a:

- A. compression amplifier
- B. class A amplifier
- C. class B amplifier
- D. push-pull circuit

80) Peak rounding:

- A. causes harmonic distortion above the knee
- B. is linear
- C. uses a feedback loop before the volume control
- D. is instantaneous

81) There are two types of compression-input and output. The difference is:

- A. the placement of the feedback loop
- B. one uses attack time, the other, release time
- C. with input compression, you can only control the output
- D. with output compression, you can only control the input

82) The signal/noise ratio of a hearing aid response is:

- A. the amount of noise a hearing aid makes when an earmold does not fit the ear
- B. of very little significance in fitting a hearing aid
- C. a comparison of the 90 dB and 60 dB input signals
- D. the difference in decibels between the signal and the noise in the system

83) Acoustic gain is measured in:

- A. decibels SPL
- B. decibels HL
- C. hertz
- D. dynes / cm2

84) The Saturation Sound Pressure level should:

- A. directly relate to the client's UCL
- B. be closer to MCL than UCL
- C. be between 120 and 130 dB for the average case
- D. be less than 120 dB for tolerance problems

85) ANSI standards can compare:

- A. patient's gain requirements
- B. one instrument to another
- C. one kind of loss to another
- D. patient's output requirements

86) When a hearing aid is dead, you can check receiver and microphone function by:

- A. cleaning the receiver with a wax loop
- B. opening the battery door to see if you hear a 'click'
- C. advancing the volume control to full on with the instrument on 'M'
- D. turning the instrument to telecoil

87) A hearing aid that works with the battery door slightly open, but shuts off when you close the door has:

- A. a broken microphone wire
- B. a weak battery
- C. wires touching the battery
- D. a faulty volume control

88) You CANNOT use feedback checks when:

- A. checking the telephone coil
- B. adjusting an output pot
- C. checking volume control intermittency
- D. adjusting a tone pot

89) An earhook damper is plugged when, during a feedback check:

- A. the instrument feeds back only when the coupler is removed
- B. feedback remains unchanged with volume control rotation
- C. the instrument makes no sound during any test
- D. feedback occurs only with the volume control at MAX

90) A sign of a dirty volume control is:

- A. intermittent static
- B. motorboating
- C. constant feedback
- D. the instrument is dead

91) Reduction of background noise can be improved by:

- A. directional microphones
- B. using a windscreen
- C. reducing tubing size
- D. none of the above

92) When a new hearing instrument has feedback at the patient's comfortable level, the problem is usually:

- A. manufacturer's error
- B. too much wax in the ear canal
- C. split receiver tubing
- D. smaller vent than appropriate

93) An ITE or Canal aid has internal feedback when:

- A. the patient loses weight
- B. the receiver tubing has excess wax
- C. the receiver tubing is not completely sealed to the sound bore
- D. the vent size is too large

Lesson #24

- Competency Building
    - Continued

1) Tinnitus means abnormal increase in loudness.

- T OR F

2) Deaf and deafened refer to the same hearing loss.

- T OR F

3) Otitis media involves the middle ear.

- T OR F

4) People with a conductive hearing loss generally have little difficulty hearing in a noisy environment.

- T OR F

5) Sensori-neural impairment may involve the cochlea.

- T OR F

6) Perceptive impairments and nerve loss of hearing are terms used to specify loss of hearing due to a malformation of the oval window.

- T OR F

#7) A sensorineural hearing loss could possibly be caused by one single loud explosion.

- T or F

8) Most sensorineural hearing losses are medically treatable.

- T OR F

9) Some portions of many mixed losses are medically treatable.

- T OR F

10) It is not necessary for most conductive hearing impairments to be evaluated by a physician.

- T OR F

11) The absence of the external auditory canal is known as stenosis.

- T OR F

12) Sound travels faster through liquids than air.

- T OR F

13) The modern pure tone audiometer is an evolution of

- A. the whisper test
- B. the watch tick test
- C. the coin click test
- D. the tuning fork tests

14) The Weber test is used to

- A. determine nerve or conductive loss in the patient
- B. find the threshold of hearing by bone conduction
- C. compare the air threshold with the bone threshold
- D. determine whether masking will be necessary in bone conduction testing

15) Masking is necessary during a bone conduction test

- A. when the two ears are 40 dB apart in acuity by bone testing
- B. when the loss of hearing in either ear is 70 dB or more
- C. when the ears are 10 dB apart by bone conductive test
- D. routinely

16) If, while testing, you suspect one ear is dead, you should

- A. retest the poorer ear but mask the better one while doing so
- B. test by bone conduction to make sure
- C. retest by bone while masking the dead one
- D. mask the dead ear and retest the good one

17) The purpose of turning the subject before testing is

- A. to keep the subject from seeing the results of the test and therby influencing test responses
- B. to keep the subject from seeing how fabulous your techniques are
- C. to surprise the subject into telling the truth during the test
- D. to avoid getting confused about which ear is which

18) In posting the audiogram for air conduction you should use

- A. hash marks to indicate masking has occurred while testing the opposite ear
- B. blue circles for the right ear, red "X" for the left
- C. red circles for the right ear, blue "X" for the left
- D. red ` X ' for the right ear, blue circles for the left

19) Should the loss of hearing be greater by bone conduction than air conduction,

- A. Plug the ear with lower bone conduction and re-test.
- B. Check calibration on the audiometer.
- C. Mask the ear with higher air conduction scores.
- D. Re-evaluate Pt’s honesty.

20) By comparing bone and air pure tone hearing thresholds you can

- A. determine what portion of the loss is sensori-neural and what part central
- B. determine susceptibility to noise-induced hearing loss
- C. find what part of the loss is sensori-neural and what part conductive
- D. determine if a person can use a hearing aid

21) Masking is used in air conduction when there is a difference between ears of:

- A. 40 dB
- B. 20 dB
- C. 30 dB
- D. 10 dB

22) The standard test frequency to begin testing pure tone air conduction and bone conduction is

- A. 250 Hz
- B. 4000 Hz
- C. 1000 Hz
- D. 500 Hz

23) Standing waves may occur at

- A. 1000 Hz
- B. 2000 Hz
- C. 4000 Hz
- D. 8000 Hz
- E. none of the above

24) Bone conduction testing problems occur at which frequency?

- A. 2000 Hz
- B. 250 Hz
- C. 1000 Hz
- D. 4000 Hz

119

25) Audiometers should be electro-acoustically calibrated at least every

- A. month
- B. three months
- C. year
- D. two years

120

26) Generally bone conduction oscillators do not produce more than

- A. 50 dB
- B. 90 dB
- C. 40 dB
- D. 70 dB

27) The method of masking for air conduction and bone conduction is

- A. ascending
- B. ear-choice
- C. plateau
- D. descending

28) If the subject has head noises and has trouble distinguishing whether it is the noise or the test tone, use the following type test presentation:

- A. warble, or pulsed tone
- B. narrow-band noise
- C. continuous noise
- D. white noise

29) The most effective masking used in pure tone audiometry is

- A. narrow-band
- B. white
- C. saw-tooth
- D. complex

30) Identifying clients and selecting the appropriate masking level with conductive hearing losses is

- A. a simple process with few problems
- B. very difficult without impedance tests
- C. only difficult when one ear is non-functioning
- D. difference between the two ears
- E. no problem as long as there is less than 40dB

31) A hearing aid

- A. is an absolute necessity for those peoples who can't learn how to read lips
- B. amplifies sound
- C. improves your hearing
- D. improves the signal to noise ratio

32) A battery achieves its "pumping" action by

- A. removing electronics from the storage device
- B. a process called OHMS LAW
- C. separating and holding the positive and negative charges onto two separate terminals
- D. storing anode and cathode charges in an electrolyte

33) Essentially, a capacitor passes high frequencies and blocks low frequencies.

- T or F

34) The gain of a hearing instrument may be measured at

- A. full on gain
- B. 50 dB input for AGC instruments
- C. reference test gain control setting
- D. all of the above

#35 – Slide 128

- 35) The nerve fibers of the hearing nerve, at the point of maximal stimulation of the basilar membrane, will discharge (i.e. discharge and recover) at the rate of:

- A. 500 times or cycles/sec.
- B. 1000 times or cycles/sec.
- C. up to 1 Khz, identical to stimulus frequency
- D. 750 times of cycles/sec.

36) What is true of the external auditory canal?

- A. the outer 2/3 is skin over bone
- B. the inner 1/3 is skin over cartilage
- C. it has hair cells
- D. it is usually straight
- E. none of the above

37) If a sound consists of more than one frequency without a pattern, it is called a:

- A. transverse wave
- B. noise
- C. sine wave
- D. reverberation

Chapter 24: Competency Building #3

Chapter #24

Competency Building #3

1) With open canal earmold fitting:

- A. there is a smaller volume of air existing in the ear canal
- B. there is minimal chance of feedback
- C. you get high frequency assistance because of low frequency suppression
- D. all of the above

2) Tommy complains that his aid sounds tinny. What might be your initial thoughts:

- A. too much gain
- B. not enough SSPL
- C. too much high frequency amplification
- D. all of the above

3) The microphone:

- A. picks up incoming signals
- B. converts energy from acoustical to electrical
- C. converts energy from electrical to acoustical
- D. a and b

4) The receiver:

- A. picks up incoming signals
- B. converts energy from acoustical to electrical
- C. converts energy from electrical to acoustical
- D. a and b

5) The input signal of a hearing instrument is:

- A. the sound going to the microphone
- B. the sound going into the receiver
- C. the sound going into the ear
- D. none of the above

6) When fitting binaurally, you can generally expect:

- A. better localization ability
- B. better aided discrimination
- C. to need 3-5 dB less gain
- D. all of the above

 7

7) When selecting the desirable SSPL of a hearing instrument, the most important consideration is the user's:

- A. SRT
- B. UCL
- C. SLOPE
- D. Clarity Percentage Quotient

 8

8) The dynamic range is:

- A. UCL - SRT
- B. MCL - SRT
- C. UCL - MCL
- D. all of the above

 9

9) If the average loss is 64 dB, the user will need the hearing aid:

- A. never
- B. full time
- C. part time
- D. none of the above

 10

10) Venting an earmold allows:

- A. reduction of high frequencies
- B. mid -frequency emphasis
- C. low frequency emphasis
- D. reduction of low frequencies

11) The major components of a hearing aid are:

- A. capacitor, amplifier, and receiver
- B. microphone, amplifier, and receiver
- C. microphone, transistor, and receiver
- D. microphone, capacitor, and transistor

12) Hearing habilitation may include:

- A. auditory training
- B. lip-reading
- C. amplification
- D. all of the above

 13

13) Transduction is:

- A. aided vs unaided results
- B. change of energy from one form to another
- C. taking place in the amplifier
- D. b and c

 14

14) The hearing aid is full-on, the input is 64 dB, the curve runs from 200 - 5000 Hz is the:

- A. Frequency response curve
- B. Frequency range
- C. FOG curve
- D. SSPL curve

15) Input is 90 dB, hearing aid is full-on. You run a curve from 200-5000 Hz. This is the:

- A. Frequency range
- B. SSPL curve
- C. FOG curve
- D. Frequency response

16) Reference test gain is:

- A. the same as full-on in mild gain aids
- B. a more realistic setting than full-on
- C. 77 dB less than the HFA SSPL-90
- D. all of the above

17) Input is 60 dB, volume control is set in the reference test position. This curve represents:

- A. FOG gain
- B. Frequency range
- C. SSPL response
- D. Frequency response

18) HFA is determined by averaging the values at:

- A. 1000,1600, and 2500 Hz
- B. 1000,1500, and 2000 Hz
- C. 500,1 600, and 2500 Hz
- D. 1000,1500, and 2500 Hz

19) If a hearing aid is dead, it may be due to:

- A. clogged microphone
- B. wax in the receiver
- C. battery
- D. all of the above

20) If a hearing instrument has feedback, it will NOT be due to:

- A. a hole in the tubing
- B. a poor fitting mold
- C. a dead battery
- D. a and b

21) A BICROS hearing aid consists of

- A. mic on the unaided side and a mic, amp, rec on the aided side
- B. mic on the unaided side and an amp and receiver on the normal side
- C. rec on the aided side and a mic, amp, rec on the normal side
- D. none of the above

22) If a person has an SRT of 50 dB, a LDL OF 110 and MCL of 70 dB, what is his Dynamic Range:

- A. 20 dB
- B. 40 dB
- C. 50 dB
- D. 60 dB

23) If a person has a 70 dB SRT with a sensorineural loss, he will require how much FOG in an ITE aid:

- A. 60 - 65 dB
- B. 30 - 35 dB
- C. 50 - 55 dB
- D. 40 - 45 dB

24) If a person has an MCL of 80 dB HL for speech with a sensorineural loss, he will require how much FOG in an ITE aid:

- A. 60 - 65 dB
- B. 40 - 45 dB
- C. 30 - 35 dB
- D. 50 - 55 dB

25) If a person has a LDL of 100 dB HL for speech, the output should be no greater than:

- A. 100 dB SPL
- B. 110 dB SPL
- C. 130 dB SPL
- D. 120 dB SPL

26) What is the sound picked up from the environment called:

- A. gain
- B. output
- C. input
- D. none of the above

27) The selection of the frequency response of the hearing aid is most affected by what audiometric factor:

- A. slope of the audiogram
- B. SRT
- C. UCL
- D. air bone gap

28) The MPO/SSPL 90 is chosen by considering the user's:

- A. UCL / TD / LDL
- B. SRT
- C. Thresholds
- D. MCL

29) Based on the slope fitting method, in a high frequency hearing loss, where will you typically have the greater amount of gain:

- A. below 1000 Hz
- B. above 1000 HZ
- C. equal gain at all frequencies
- D. none of the above

30) Which hearing loss requires the largest vent:

- A. flat
- B. all require same venting
- C. ski slope
- D. gentle slope

31) Which hearing loss can be fitted binaurally?

- A. sensorineural
- B. mixed
- C. conductive
- D. all of the above

32) Which slope of hearing loss would likely use a low frequency tone control :

- A. precipitous
- B. gradually sloping
- C. ski slope
- D. all of the above

33) Lower frequency sounds will be heard first by the opposite ear before higher frequency sounds. This is because of the:

- A. lombard effect
- B. mirroring effect
- C. head shadow effect
- D. carhart effect

34) Polyethylene is a:

- A. used in the making of the receiver tubing
- B. used in ITE's for allergies
- C. ear mold for allergies that is made of lucite
- D. ear mold for allergies that is semi-rigid white material resembling paraffin

35) The following requires a manufacturer to repair:

- A. change in the hearing aid Matrix
- B. electronic feedback
- C. change in the volume control
- D. all of the above

36) Parallel and diagonal refer too:

- A. types of resistors
- B. types of vents
- C. types of transistors
- D. none of the above

37) The smaller the inside diameter and longer the tubing will give you:

- A. more highs
- B. more lows
- C. none of the above
- D. less lows

38) When you place the otoblock past the second bend you should use:

- A. cotton with string
- B. foam with string
- C. a or b
- D. none of above

39) Harmonic distortion can be found by using:

- A. hearing instrument analyzer
- B. free field
- C. real ear
- D. sound field

40) The average natural resonant frequency of the ear canal is:

- A. 1500 Hz
- B. 3300 Hz
- C. 2700 Hz
- D. 2100 Hz

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41) The average amplitude of the resonant peak in the ear canal is:

- A. 0 to 5 dB
- B. 15 to 20 dB
- C. 20 to 25 dB
- D. 10 to 15 dB

 42

42) Variable controls such as peak clipping, output compression and input compression can be classified as:

- A. tone controls
- B. output limiting controls
- C. input limiting controls
- D. frequency compression controls

43) It is typical of the tone controls that the:

- A. bass frequencies are changed
- B. mid frequencies are changed
- C. treble frequencies are changed
- D. all of the above

44) The induction pickup for a telecoil is:

- A. electronic
- B. mechanical
- C. magnetic
- D. acoustical

45) Which of the following are types of feedback identified with hearing aids:

- A. acoustical and mechanical
- B. electrical and magnetic
- C. a and b
- D. none of the above

46) What is the point called where the hearing aid departs from linearity and goes into compression:

- A. curvilinear compression CAT
- B. logarithmic compression CAT
- C. compression knee, or Kneepoint
- D. compression ratio

47) What is the advantage of the canal hearing aid:

- A. less output required
- B. cosmetic
- C. less gain required
- D. all of the above

48) Which of the following would be a reason to NOT fit a person with binaural amplification:

- A. no balance advantage
- B. inability to fuse sound
- C. drop in discrimination score when tested binaural as compared to monaural discrimination score
- D. all of the above

49) One of the first things the dispenser should note upon the patient's arrival for the follow-up session is:

- A. the volume control setting of the hearing aid
- B. the patient's comments with regards to the hearing aid
- C. If the patient is wearing the hearing aid
- D. that the hearing aid is inserted correctly

50) If you have pure tones at .5 K l0 dB, at l K 15 dB and at 2 K 50 dB what is your PTA:

- A. 25
- B. insufficient information
- C. 12.5
- D. 75

51) If you have a drop of 0 to 5 dB per octave what slope do you have:

- A. sloping
- B. flat
- C. gradually sloping
- D. reverse slope

52) If you have a drop of 20 to 25 dB per octave what slope do you have:

- A. reverse slope
- B. flat
- C. sloping
- D. ski slope

53) One of the reasons for counseling the hearing aid user is that:

- A. They will not know what to expect from the new hearing aid
- B. They will have to get used to the new sound of their own voice
- C. The hearing aid is new to them
- D. all of the above

54) The four things that you will need to have sound is:

- A. battery, force, vibrator, and hearing mechanism
- B. medium, force, vibrator, and hearing mechanism
- C. medium, force, battery, and hearing mechanism
- D. medium, battery, vibrator, and hearing mechanism

55) When you see AS (Auricula Sinister/Auris Sinistra on a chart it refers to:

- A. the right ear
- B. both ears
- C. none of the above
- D. left ear

56) When you see AD (Auricula Dexter/Auris Dextra a chart it refers to:

- A. both ears
- B. the right ear
- C. the- left ear
- D. none of the above

57) When you see AU (Auris Uterque) on a chart it refers to:

- A. none of the above
- B. both ears
- C. the right ear
- D. the- left ear

58) The office should keep the records of their patients/clients for:

- A. up to three years
- B. until the patient dies
- C. as the state would require
- D. none of the above

59) A hearing loss caused by ototoxic drugs would be

- A. average
- B. common
- C. least likely
- D. very likely

60) If a patient/client came to you with a draining ear and medical clearance you would:

- A. have the patient follow medical recommendations and show them how to clean their hearing aid
- B. clean the ear for the patient with alcohol
- C. do nothing and send back to the referring Doctor
- D. none of the above

61) The FDA would not require the patient to have a medical clearance for:

- A. being fit for a replacement aid or ear mold less than six months since the last fitting
- B. the fact that the patient was informed about the medical clearance, but signed the waiver
- C. the fact that you did not complete the fitting of hearing instruments
- D. all of the above

62) The FDA would require you to do the following:

- A. have both the medical clearance and waiver for each patient/client
- B. have your degree in audiology
- C. have both the sound booth and the audiometer calibrated annually by the manufacturer
- D. none of the above

 63

63) The FDA stands for:

- A. Food and Dairy Administration
- B. Food and Drug Administration
- C. Federal Drug Administration
- D. none of the above

 64

64) If the patient has built up resentment and has a need for binaural amplification he will:

- A. be happy with the fitting
- B. be unhappy With the fitting
- C. be one of your best patients
- D. all of the above

65) If you have a hearing loss of 30 dB at 500 Hz, 35 dB at I K, and 60 dB at 2 K your configuration of the audiogram would be closer to:

- A. ski slope
- B. cookie bite
- C. corner
- D. reverse slope

66) A tinnitus masker/hearing aid would work for a person with:

- A. Meniere's Disease
- B. wax in the ear canal
- C. hole in the tympanic membrane
- D. discontinuity of the ossicular chain
- E. the need for a Halloween costume

67) Understanding another person's problems without becoming emotionally involved is called:

- A. empathy
- B. in touch
- C. caring
- D. sympathy

68) If the hearing instrument operates normally in the telecoil position, but will not operate otherwise, the main problem may be

- A. the receiver
- B. the microphone
- C. the battery
- D. the amplifier

69) The maximum SSPL of the hearing aid can be controlled by:

- A. peak clipping
- B. agc/avc
- C. compression
- D. all of the above

Chapter 25: Ethics & Legal Considerations

Chapter #25

Ethics and Legal Considerations

Objectives

- Basic Principles of Ethics in Dispensing
- General Definition
- Conduct and Relationship with Patient
- Responsibility to the Profession and Colleagues
- Advertising
- Standards

Objectives

- Discrimination
- Association
- Conclusion

 3

Standards

- Professional Integrity
- Professional Practice
- Relationships
- Adherence
- Assurance to the Public
- Pledge

 4

Pledge

- State only true facts in:
  - Public Announcements
  - Advertising
  - Related Products
- Shall not:
  - Mislead
  - Misrepresent
    - Performance of Instruments

Pledge

- Benefits
- Elements
- Use

- Shall provide
  - Thorough consulting services
  - Ethical consulting services
  - Appropriate testing and fitting

Pledge

- Shall Provide
  - Best Possible
    - Services
    - Counseling
    - Understanding
    - Technical Assistance
  - All to derive maximum benefit from their hearing instruments.

Pledge

- Shall constantly encourage research
- Shall constantly support research
- Shall constantly cooperate with medical and other hearing health professionals to employ maximum accumulation of scientific knowledge and technical skills in selection and fitting of hearing instruments.

Standards

- Continuing Education
- Medical Referrals
- Accept and seek full responsibility for the exercise of judgment in area of your expertise.
- Shall not guarantee outstanding results when it is not the case.
- Shall exercise caution not to mislead persons to expect results that cannot be predicted.

Standards

- Confidentiality regarding patient records
- Conduct regarding professional colleagues and hearing care professions
  - Patient welfare
  - Professional Colleagues
    - Disparagement
    - Pejorative comments
    - Inaccuracies

Standards

- Enhancing the status of the profession.
- Supportive of individuals and organizations
- Refusal to practice under conditions which impair proper exercise of judgment and skill or which deteriorate of service quality or which requires a breach of ethics.

Standards

- Maintenance of Records
- Fees and Compensation
  - Agreements and division of fees.
  - Exploitation when rendering services.
- Delay in Providing Services.
- Discontinuance of Services.
- Safety and Sanitation.

Responsibility to the Profession and to Colleagues

- Duty to observe all laws, rules, and regulations.
- Duty to uphold the dignity and honor of the profession.
- Duty to accept its ethical principles.
- Shall not engage in any act to bring discredit to the profession and SHALL expose without fear illegal or unethical conduct in the profession.

 13

Advertising

- Use only ethical material complying with laws, rules and regulations governing advertising.
- Shall endorse the following:
  - Truth – tell the truth and reveal significant facts, the concealment of which would mislead the public

 14

Advertising

- Be willing and able to substantiate claims made.
- Taste and Decency
- Disparagement
  - Offer “service or merchandise” on its merits.
  - Refrain from attacking competitors.

Advertising

- Bait Advertisement
  - Readily Availibility
  - No bait and switch
- Guarantees and Warranties
  - Explicit Disclosure
  - No false, misleading, or deceptive guarantees.

Standards

- No violation of laws, rules or regulations applicable to dispensing.
- Prohibited terms: Titles not in fact.
- Hearing Instrument Specialist.
- Symbols connoting medical profession.
- Prohibited terms used to confuse the public regarding governmental, non profit medical, educational, or research institution.

Discriminatio

- On Race, national origin, religion, sex, age or marital status.

Association

- Betterment of the Profession.

Ethics

- Branch of philosophy that defines what is good for the individual and for society and establishes the nature of obligations, or duties, that people owe themselves and one another. In modern society, ethics define how individuals, professionals, and corporations choose to interact with one another.

Legal vs. Ethical

Is it possible to be legal and unethical?

Is it possible to be unethical and legal?

Normally, ethical standards do not allow for legalities.

Ethical is ALWAYS LEGAL.

Legal vs.

1. Everyone functions in what one perceives to be in one's own best interest. Personal, moral codes are up to each individual. Group codes are not.
2. You don't need anyone to tell you when you are illegal or unethical.
3. Not everyone who acts differently from you is not illegal or unethical.

What defines this profession?

- Healthcare
- Commerce.
- Selflessness and healthcare.
- Benefit.
- Altruism.
- Similar goods and services.
- Image to the public.

Legal Issues

- Advertising
- Contracts

Advertising

- Don't
  - But, if you do,
    - The public is THE JUDGE
    - Use constraint.
    - Be exact.
    - Watch price advertisements.
    - Free Hearing Tests
    - No pre-set appointments.

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Advertising

- Research and Study Ads
- Price Points
- Special Services

 26

Ethics

- Before 1979
- After 1994
- Ethics change.
- The Hearing Instrument Field is changing rapidly.
- Ethics are changing.
- Old advertising methods are now probably deemed unethical by the informed public.

Ethics

- When is a correct business decision in conflict with a correct healthcare professional decision?
- Does more knowledge and more experience mean that your services should be more expensive?
- Is every profession a conspiracy against the public? [George Bernard Shaw]

Ethics

What lies behind the decisions you make?

What would your closest and most trusted friends think about a choice?

Chapter 26: Sales & Marketing Techniques

Chapter #26

Sales & Marketing Techniques

Objectives

- Strategic Marketing Plan
- Logo
- Branding
- Website Presence
- Professional Referral Market
- Marketing Matrix
- Use of Telephone
- Media

Objectives

- Television
- Radio
- Newsprint
- Magazine
- Free Publicity
- Seminars
- Newsletter/eNewsletter
- Community Service

Strategic Marketing Plan

- √ Starting from Day One
  - √ Current Circumstances
  - √ Patient Potential
  - √ Market Size
  - √ Competition
  - √ Summarization

Strategic Marketing Plan

- First Year Strategy
  - Who or what is your product?
  - How much will your service and products cost?
  - Where is your base?
  - How will you promote your service and products?

Strategic Marketing

- Tactics
  - Advertising
  - Special Events
  - Public Relations
- Financial Roadmap and Timing
- Who's Leading, Who's Following

Logo

- Shapes
- Objects
- Color
- Simplicity
- Linkage
- Uniqueness

 7

Branding

- Philosophy
- Healthcare
- Product
- Profession
- Yourself
- How you will be known

 8

Website Presence

- Creation
- Target
- Simplicity
- Current News
- Interactivity
- Ease of use

Website Presence

- Visibility
- Dynamic vs. Static

Professional Referral Market

- Primary Care Physicians
- ENT?
- Allied Health Colleagues
- Retirement Community Management
- Medical Specialists

Marketing Matrix

- Single Focus – Direct Mail
- Integrated Focus – Mail Plus
- Mail Plus Calls
- Limited Offers?
- Pricing
- Bait?

Use of Telephone

- TCPA
- Lists
- Dangers
- Opportunities
- Approach
- Target
- Presentation

 13

Media

- Who's branding in your neighborhood?
- What are your competitors' weaknesses?
- What's the law?
- When do you advertise?
- Why are others successful?
- How will you command the market?

 14

Media

- What about your MFG partner?
- When not to advertise…
- Get out your annual calendar and call your outside rep's.
- Get out your brand.

Television

- Very expensive and
- Potentially VERY rewarding
- It's all about the message.
- It's not a one-shot three pointer at the buzzer if you are behind by two.

Radio

- C) Finding your market.
- C) Creating? Urgency?
- C) Talk Radio?
- C) Seniors?
- C) Baby Boomers?
- C) What's the message?

Newsprint

- :X Hey, when's HAD [hearing aid day]?
- :X Joining the crowd?
- :X Why?
- :X Why do people answer ads when the standard test:fitting percentage is 20 US wide?
- :X How are you unique?

Magazine

- Which ones?
- Get creative.
- Carve new ground.
- Senior-density groups.
- Attractiveness.
- Simplicity.
- Directness.

Free Publicity

- Press Releases
- Announcements
- Notice of Certifications
- Free Services
- Nothing ventured
- Senior clusters

Seminars

- Strategy
- Educational
- Motivational
- Compassionate
- Stewardship
- New Generation – New Message
- New Protocol

Newsletter/eNewsletter

- You can be a click away.
- Seniors numbers.
- Print or click, or both.
- Humor
- Education
- Branding
- Substantive

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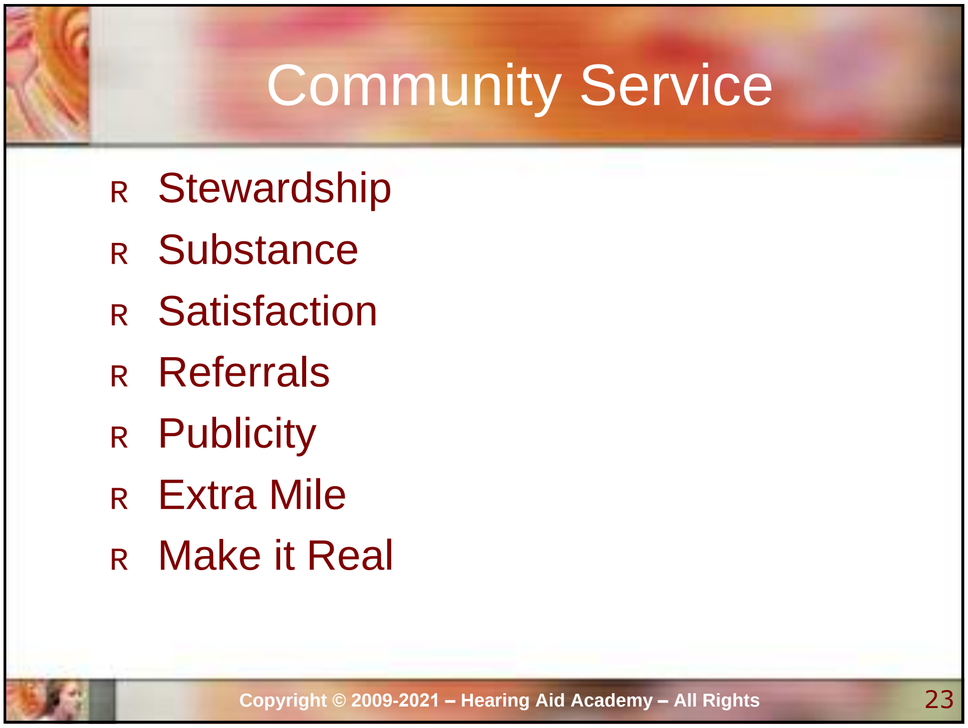

Health Fairs – Golden Opportunities, By Max Chartrand, PhD. March 8th, 2021

I love health fairs for getting people excited about hearing solutions for hearing problems. I think too often we keep them low key and unimaginative. Let me describe how my practice has always done this--and you will understand why we were always the busiest booth in every fair we ever attended. Get ready for a lot of fun and boldness:

-Set up big--take at least two spaces and bring some staff--if you don't have enough staff, hire some temporary staff--set up for a process and experience. You will have a video otoscope on the biggest screen you can get there and you personally will man it or a highly competent person. Also have another monitor set up with a continuous play film going about hearing loss and effects of health, especially cognitive health--have captioning on and sound off. Set up a few chairs in front of it like a little theater so people can rest their feet and learn something they didn't know. I think Oticon puts out some good stuff for this now, but there are others, too. Make up a one page Screening Hearing Health Profile form that has a place for name and contact info, a statement of confidentiality, a series of 5 or 6 case history questions, a small audiogram that you may or may use during the fair, but allows you to screen if you have that capability---ok if you don't.

The first stop for everyone coming by is to be given a clipboard with the Screening Hearing Health Profile and a brochure or handout about your services. Don't focus on hearing aids--focus on hearing health, of which hearing aids are just a part, albeit an important one. Instead, get them to open up: ***What kinds of problems are your having with your hearing?*** is the opening rejoinder to any inquiry about their hearing.

-Take them to the video otoscope and show them what their ear looks like and note any Red Flag conditions and if they need referred to an otologist. Note their case history responses (I can send you a form we've used if you like), and let them tell you about their problem.

-When they open up about their hearing problems, you need to schedule them for a no cost hearing evaluation--so have your schedule there--give them at least a 90 minute slot. If you opt to just giving a screening test, maybe 30-minute slots because you still need time to visit with them and answer questions.

-As soon as you get the first person onto the big screen with your video otoscope (keep the images on the screen if at all possible in freeze frame or hold the camera into the ear canal long enough for people to take it all in) others will start coming over to your booth for you to look into their ears. Don't do it until they've filled out the Screening form and you've had a chance to visit a bit about their hearing challenges. Focus on how hearing loss is affecting their life--let them talk about it.
Talk about tinnitus (it's "the search party out looking for the missing hearing"), how their life is disrupted, how it affects relationships, education, work, recreation....the more they talk about it, the more trust they have in you.

From each such event you should come back with a handful of appointments--do them well, thoroughly, be ready to refer when indicated and don't just give them a card leaving them to make contact with the ENT on their own--help set that appointment for them and send over a note to the doctor explaining why you are sending them. (Observe HIPAA, of course)

Make a fan fare out of every event, never sit behind a table. Put the table against the wall and you stand out in front. Look at your own ear a few times so people can see what it's all about enough to get them over to you. Never sit behind the table (I just said that, didn't I?--well, if you want to excite the hearing impaired, don't sit behind the table like everyone tends to do--smile).

Let me know if I can help in any way. I love health fairs and think too many vendors give them short shrift and treat them like flea markets---treat them like golden opportunities to attract, excite, motivate, and help the hearing impaired.