

Audiometric Techniques

Aural History and
Visual Inspection of the Ear

Aural History

- Background information about the employee
 - Family history of hearing loss
 - Medical history of employee
 - History of noisy recreational activities
 - Other noise exposure

Aural History

- When?
 - Taken before baseline audiogram
 - Updated during annual audiogram
- Why?
 - Help OHC administer hearing test
 - Aid professional reviewer
 - Determine proper follow up
 - Determine work-relatedness

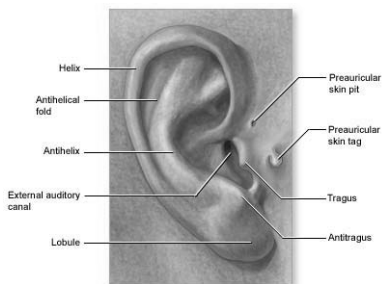
Visual Inspection of Ear

- After taking aural history
 - Keep in mind any conditions described in history
- Explain to employee what you are doing and why
 - "I'm going to look in your ears to check for anything that will prevent me from getting an accurate hearing test."

Observations of Pinna

- Note dermatitis, drainage, or other medical condition
- Pull pinna out and up to open ear canal
- Refer to physician if:
 - Pain
 - Swelling
 - Obvious infection

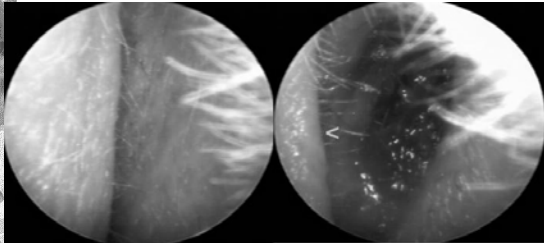
Pinna



Checking for Collapsing Canals

- Use otoscope light with no speculum
- Press outer edge of pinna (helix) against the head
 - Simulates effect of ear phone cushion
- Observe if ear canal opening closes

Collapsing Canal



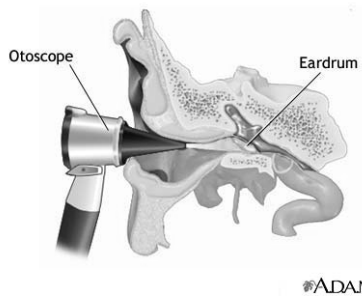
Collapsing Canals

- May cause artificial high frequency hearing loss on air conduction test
- Solutions
 - Refer employee to audiologist or ENT for further evaluation (*best*)
 - Attempt test with modifications (*worst*)
 - Prop canal open with soft, non-occluding ear piece, or
 - Remove earphone from headband and have employee hold it gently against ear during test

Otoscopic Techniques

- Use largest speculum that fits comfortably
- Pull pinna to open ear canal
- Hold handle like a pencil
- Brace hand with scope against the cheek
 - Allows scope to move if head moves
- Insert speculum slowly into canal opening

Otoscopic Technique



Alternative Technique



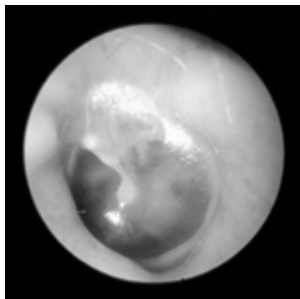
Otoscopic Techniques

- Visualize condition of canal and ear drum by looking through magnifying lens
- Adjust angle of speculum tip to account for orientation of ear canal
- Check for employee comfort
 - “Are you doing OK?”
- Avoid verbal reactions to what you see

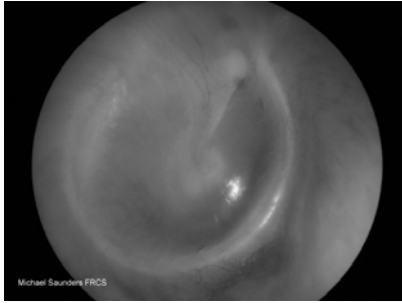
Normal Findings

- Pink tissue in ear canal
 - Adult ear canal is 2 cm long
- Ear wax
 - Very light to extremely dark
 - Nearly liquid to very dry
- Ear drum (tympanic membrane)
 - Pale gray or milky white
 - Small blood vessels
 - Outline of middle ear bones (ossicles)

Normal Ear Drum



Normal Ear Drum



Conditions to Note

- Perforated ear drum
- Unable to visualize ear drum
 - Excessive ear wax or occlusion
- Ear drainage
- Ear canal infection (external otitis)
- Other debris

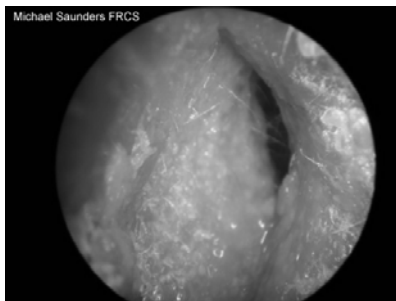
Cerumen in Canal



Cerumen on the TM



External Otitis



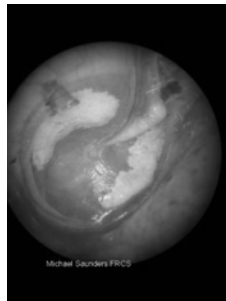
Perforated Ear Drum



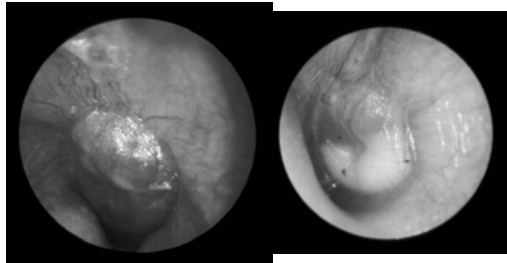
Perforated Ear Drum



Tympanosclerosis



Middle Ear Infection— Otitis Media



Middle Ear Tubes





Audiometric Techniques

Instructions, Test Procedures,
Hygiene, Considerations

Seating

- * Seat employees so they can't see audiometer controls or look directly at OHC's face
- * OHC should be able to see employee's face
- ★ * 90-degree angle is best





Audiometric Techniques

- Instructions to subject
 - Consistent + Clear = Credible

“Okay you’re gonna hear some beeps. So you should nod when you hear a beep and not nod when you don’t.”

“Do you have any questions?”



Instructions

- Make them simple, clear
- Standardize them—always the same
- Give them before ear phones are on
 - Hearing aids should be worn until test begins
- Check for understanding



Key Messages—Instructions

- Listen for tones of different pitches
- Listen carefully
- Tones will be faint
- One ear at a time starting with right (left)
- Respond every time you hear tone even if you just think you hear it
- Release button or lower finger after each response

Example of Instructions

“You will hear a series of tones at different pitches. It will sound like (beep beep)
Each ear will be tested separately, starting with the left. As soon as you hear a tone, even if it is very faint, press the button, then release it. Do you have any questions?”

Before Placing Ear Phones

- Remove hearing aids, eyeglasses, ear rings, hats
- Pull hair back
- No gum, drinks, smoking, chewing tobacco
- Phones, pagers, and radios turned off or silenced

Ear Phone Placement

- You place ear phones, ideally
 - If employee places them or adjusts them, check for correct placement
- Center ear phones directly over ear canal opening
 - Remember red on right
- Adjust headband



Manual Pure-Tone Audiometry

- ANSI standard S3.21
 - In CAOHC manual
 - *Modified Hughson-Westlake technique*
- Use same procedure & sequence every time
 - Begin test in same ear each time, or
 - Begin test in better ear

Duration of Test Tone

- 1 – 2 seconds “on”
- ★ • Interval between tones at least 2 sec.
 - Vary interval between tones so no pattern is detectable

MACBUE Version 1.1.2

TONE
 YES
 ACCEPT
 + 5
 30
 dB
 HL
 -10

Patient Information	Left								Right							
Frequency(Hz)	500	1k	2k	3k	4k	6k	8k	500	1k	2k	3k	4k	6k	8k		
Current																

Frequency Sequence

1000 Hz
500 Hz
1000 Hz repeated
2000 Hz
3000 Hz
4000 Hz
6000 Hz
8000 Hz

Re-Test at 1000 Hz

- Helps determine validity of test
 - Whether employee understands test and is responding correctly
- If 1000 Hz re-test difference is more than 5 dB
 - Accept lower number
 - Re-test another frequency
 - Re-instruct employee, if necessary

Familiarization

- Familiarize employee with test tone at 1000 Hz at easily audible level such as 40 dB HL
- If no response, raise level 10 or 20 dB
- Once correct response is given, begin threshold determination
- No need to familiarize at other frequencies or in other ear

Determining Threshold

- 1st presentation 10 dB below familiarization level
- Use UP 5 – DOWN 10 procedure
 - If no response, increase level by 5 dB “UP 5”
 - If she responds, decrease level by 10 dB “DOWN 10”

Determining Threshold

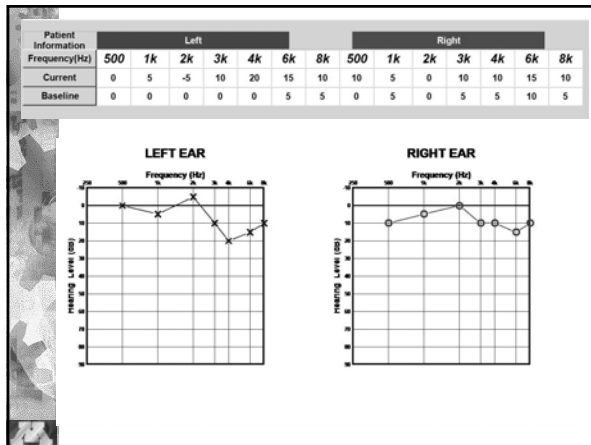
- Only one presentation at each level
- Use bracketing procedure to find lowest level where employee hears at least 50% of tones
 - Minimum of 2 out of 3 responses at a single level
 - Only count responses on *ascending* presentations
- Complete all testing in first ear before beginning test in other ear

Pulsed Tone Presentation

- Easier for many people to detect
 - Especially those with tinnitus
- 2-4 pulses typical for each presentation
 - Vary number of pulses if presenting tone manually
- ★ Vary interval between tones
 - At least 2 seconds

Recording Thresholds

- **Tabular**
 - Write threshold value for each frequency in table
- **Graphical**
 - Draw symbol for each threshold value on chart
 - Right ear RED circles
 - Left ear BLUE "X"



0 dB HL—As Low as We Go

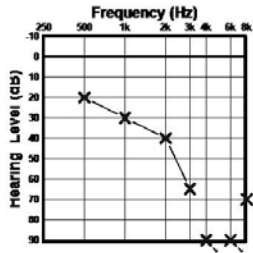
- **Don't measure or record thresholds below 0 dB hearing level (HL)**
 - Background noise levels are too high
- **Exception to UP 5—DOWN 10 rule**
 - If you get positive response at 0 dB present the tone again at 0 dB after 1-2 second interval
 - Record results as 0 dB

Recording "No Response"

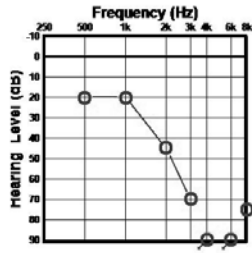
- If no positive response is obtained at highest level for that frequency:
 - Record "NR" and indicate presentation level
 - For example: "NR 85 dB" or "NR 100 dB"

No Response

LEFT EAR

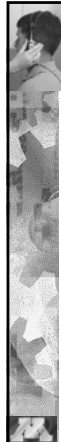


RIGHT EAR




Don't Give Cues to Respond

- Visual
 - Hand / arm movement
 - Head movement
 - Eye movement
 - Leaning
- Auditory
 - Clicking or tapping
 - Sighs or groans




Hygiene & Infection Control

- ✱ Wash hands with soap and water before eating and at the end of the day,
- ✱ Clean hands by washing or with use of a sanitizer before and after examining someone's ears or earplugs




See AAA Guideline , Audiology Today 15(5). Sept-Oct 2003



Hygiene & Infection Control

- ✱ Discard or appropriately disinfect ear specula, ear gauges, etc., that have been in contact with a patient's ear
- ✱ If the presence of blood or drainage is observed, discontinue the examination (or any hearing protector fitting), inform the patient, and consult the Professional Supervisor before proceeding.

See AAA Guideline , Audiology Today 15(5). Sept-Oct 2003



Hygiene

- ✱ Use disposable otoscope specula
- ✱ Wipe ear phones, response buttons between tests
 - Use non-alcohol wipes
