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Selecting and Fitting Ear-Level Devices for Tinnitus and Sound Intolerance Management Jennifer Ellery Martin, AuD

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Dr. Jennifer Martin earned her degrees at UC Santa Barbara, University of Nebraska-Lincoln and AT Still University. She currently holds a faculty position at the National University of Singapore, where she teaches master's degree students. She also works at the National University Hospital in Singapore as a senior audiologist. Previously, she worked as a senior tinnitus specialist at the Oregon Health & Science University. Her clinical interests include tinnitus evaluation and management, management of special auditory disorders, and hearing health promotion. Her research interests include the neuropharmacoloy of tinnitus, hearing health promotion in tribal communities and noise-induced hearing loss prevention in children.



Disclosures

- Presenter Disclosure: Financial: Jennifer Martin is employed by the National University of Singapore. She participates in research related to hearing conservation and neuropharmacoloy of tinnitus. Jennifer Martin received an honorarium for this presentation. Nonfinancial: Jennifer Martin has no relevant non-financial relationships to disclose.
- Content Disclosure: This course discusses the programming of devices from Signia, ReSound, Widex and Oticon.
- Sponsor Disclosure: There is no external sponsor for this course.



Learning Outcomes

After this course, participants will be able to:

- Define the role of sound therapy as part of the tinnitus/sound intolerance management plan.
- Explain when each type of device (hearing aid, sound generator, combination unit) would be used as part of the management plan for patients with tinnitus and sound intolerance.
- Describe the differences between fitting hearing aids for hearing loss (prosthetic) and fitting hearing aids for tinnitus and sound intolerance management (therapeutic).



Tinnitus Management

- Education and Counseling
- Stress reduction and Relaxation
- Therapeutic sound



Therapeutic Sound

- "any use of sound where the intention is to alter the tinnitus perception and/or the reactions to tinnitus in a clinically meaningful way" Hoare et al. (2014)
- "using external sounds to provide relief from tinnitus" Folmer & Carroll (2006)
- "sound is used to directly or indirectly shift attention away from the tinnitus" Henry et al. (2008)



Therapeutic Sound

- Using sound to facilitate habituation
 - To the perception of tinnitus
 - To the reaction to tinnitus
- Very broad area
 - Can use the general guidelines of sound therapy rather than a particular method



Therapeutic Sound

- There are lots of delivery methods for sound
 - Speakers
 - Headphones
 - Sound pillows
 - Ear-level devices
- Today we will focus on ear-level devices



Therapeutic Sound-Guidelines

- Low level sound that is not bothersome
- Should not interfere with communication or concentration
- Reduces the brain's ability to focus on the tinnitus



Therapeutic Sound-Purposes

- Sense of relief from tinnitus-related stress
 - Soothing sound
- Passive diversion from tinnitus
 - Background sound
- Active diversion from tinnitus
 - Interesting sound

Henry et al. (2008)



Therapeutic Sound-Types of Sound

- Environmental sound
- Music
- Speech





- Sound generators
- Hearing aids
- Combination units



- Sound Generators
 - Ear level devices
 - No amplification
 - Some have multiple sound options
 - Some are programmable
 - Various styles
 - Less expensive than hearing aids



- Hearing aids
 - Amplification only
 - Wireless options for sound streaming



- Combination units
 - Amplification only
 - Sound generator only
 - Combination of both
 - Can also use wireless devices to stream sounds





Benefits of Amplification

- Improved ability to hear soothing sound, background sound and distracting sound can provide relief from tinnitus-related stress
- Reduction in tinnitus loudness
- Less stress associated with straining to hear
- Stimulation of the auditory system





Considerations: Device Type

- Hearing Aid versus Combination Unit
 - Starting Point:
 - HA for normal hearing to mild HL in LF
 - CU for greater than mild LF loss
 - McNeil et al. (2012)
- Always be open to trying both to allow patient to decide what works best for them
- Current technology: order a hearing aid with onboard sound and/or streaming capabilities and turn on/off features as needed



Considerations: Device Style

- Open fit
 - Slim tube BTE
 - Receiver in the canal
- If hearing loss is too great for open fit, then use maximum venting possible



Considerations: Monaural vs Binaural

- Binaural fitting for binaural hearing loss, even if the tinnitus is only present unilaterally
 - Provides more normal auditory balance



Considerations: Prosthetic vs Therapeutic Fitting

- Most hearing aids are fit prosthetically
 - Fitting to replace the lost hearing
 - Focus on audibility and speech clarity
 - Use HA features to enhance speech in noise
- Tinnitus often requires fitting therapeutically
 - Changes are made to the programming to allow the hearing aid to have more effect on the tinnitus perception



Considerations: Prosthetic vs Therapeutic Fitting

Method 1:

- Which is the BIGGER problem?
 - HL: Fit for the hearing loss and patient's communication needs
 - Tinnitus benefit is secondary goal
 - Tinnitus: Fit primarily for tinnitus relief
 - Improved communication ability is secondary goal
 - Can have two programs: one for HL and one for tinnitus



Considerations: Prosthetic vs Therapeutic Fitting

Method 2:

- Always fit the hearing loss first
 - The majority of patients will get some relief from the tinnitus with a well-fit hearing aid
- If the patient does not experience enough benefit for the tinnitus over time, changes can be made to the programming specific to tinnitus

Henry et al. (2008)



Considerations: Acoustic Programming

- Use feedback reduction for most open fit
- Disable internal noise reduction (expansion)
- Disable environmental noise reduction (ANR)
- Low compression knee point
- Omnidirectional microphone setting
- Fitting protocol: DSL I/O v5

Searchfield (2006) Henry et al. (2010) Wise (2003)







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Expansion





Expansion

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Expansion





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Compression







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Compression





Compression





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Directionality





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- Sound Generator versus Hearing Aid/Combination Unit
 - Is there hearing loss?
 - Does the introduction of low-level background sound make it difficult to hear quiet conversation?
 - Can the hearing loss be addressed at the same time or does the SI have to be dealt with first?



Occlusion versus Venting

- Starting with a fully occluded fitting allows for:
 - Maximum passive filtering of unwanted external sound
 - Maximum control over what sound is entering the ear
 - Amplification/limiting will only be applied if the sound is forced through the microphone and amplifier
 - A greater sense of control for the patient over what is allowed to enter their ears
- Fitting can be made more open as sound intolerance improves





Programming Modifications

- Low compression knee point + higher than normal compression ratio
 - Use hearing aid as amplifier <u>and</u> limiter
 - As sound intolerance improves, compression ratios can gradually be reduced
- Reduce maximum power output (MPO)



 Before adjusting the MPO in the HA, you may need to change the LDL value from HL to SPL

FREQ	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
HL to SPL	+25 dB	+11 dB	+7 dB	+9 dB	+9 dB



MPO





MPO





Case Studies



Case Study #1

 You have a patient with bilateral high-pitched tinnitus



- Their primary concern is the tinnitus; secondary concern is difficulty with high-pitched voices, especially in noise
- You would like to trial hearing aids for this patient

slido



What type of device, fitting strategy and dome would you most likely choose for this patient?

① Start presenting to display the poll results on this slide.



Case Study #2

- You have a patient with sound intolerance and hearing thresholds of 20-25dB HL across all frequencies.
- One month ago, you fit them with:
 - RIC hearing aids bilaterally
 - Double domes for maximum occlusion
 - No amplification
 - Pink noise at a comfortable level chosen by the patient
 - LDLs not tested due to patient concerns at the time



Case Study #2

- At one-month follow-up, the patient reports the following:
 - The pink noise is comforting, and they have been able to increase the volume several steps since the fitting
 - With the occluding domes and pink noise, they are having some trouble hearing soft conversations
 - Some high frequency, loud sounds still cause discomfort, even with the occluding domes
 - Examples were traffic horns, children screaming and ambulance sirens





What adjustments would you like to make to the devices for this patient?

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Case Study #2

- Prescribe amplification
 - Focus on soft input gain
 - Little to no gain for moderate to loud inputs
- Measure LDLs and adjust MPO values if needed
 - Adjustment most likely be needed at high frequencies
- May need to adjust the base level of the pink noise so that they have additional room for future increases



Special Considerations

- Each tinnitus patient is unique and requires individualized care
- Program devices to meet the patient's individual hearing, tinnitus and comfort needs
- Perform probe microphone measurements whenever possible to verify acoustic fit
- Multi-disciplinary care is best
- If you are not a tinnitus specialist, understand when it may be necessary to refer



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