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How do you solve a problem like Single Sided Deafness? In partnership with the American Academy of Audiology

Virginia Milne, AuD

Melanie Lutz, AuD



Melanie Lutz, AuD

Melanie Lutz is an audiologist and sales representative at e3 Diagnostics. She has clinical experience as a pediatric audiologist and has served as an adjunct professor. Melanie received her AuD from Washington University Medical School in St. Louis and her BS from Towson University. Melanie also volunteers with AAA.



Virginia Milne, AuD

Ginny Milne is an audiology coordinator at UPMC and an adjunct faculty member at the University of Pittsburgh. She coordinates UPMC's adult auditory processing clinic and the audiology department's credentialing, insurance and billing efforts. She received her AuD from the Northeast Ohio AuD Consortium (NOAC) and her BA from Case Western Reserve University. She is a member of the AAA JFLAC class of 2022 and currently serves as the AAA Membership Engagement Council Chair. .



Disclosures

- **Presenter Disclosure:** Financial: Melanie Lutz is an employee of e3 Diagnostics. She received an honorarium for this presentation. Non-financial: Melanie Lutz has no relevant non-financial relationships to disclose. Financial: Ginny Milne is employed by the University of Pittsburgh Medical Center and the University of Pittsburgh. She received an honorarium for this presentation. Non-financial: Ginny Milne serves as the Membership Engagement chair for the American Academy of Audiology and on the credentialing review committee for Amplifon.
- **Content Disclosure:** This learning event does not focus exclusively on any specific product or service.
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- The applicability and accuracy of the course content may vary by the clinical, geographical, and cultural context; you should evaluate the course accordingly.
- As healthcare is rapidly evolving, new findings may change the validity of the information presented in this course. Providers should always consult the latest research and guidelines from professional associations.
- The interventions discussed in this course may be limited in generalizability, requiring practitioners to consider specific individual and population factors.
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- Healthcare providers should apply cultural competence and sensitivity to ensure effective and respectful care based on their patients' diverse needs.
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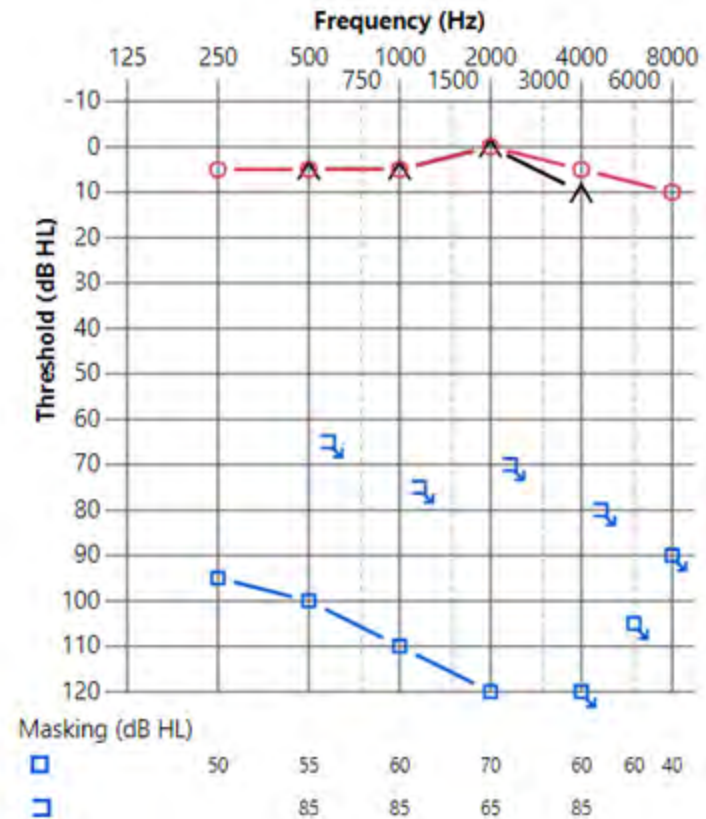
Learning Outcomes

After this course, participants will be able to:

- Identify treatment options for patients with SSD.
- Summarize potential challenges in the audiologic management of SSD.
- Discuss possible adjustments to the current SSD protocol in their practice.

Single-Sided Deafness

- Defined as patients with:
 - Significant pure tone loss
 - Poor WRS
 - Possible sound intolerance
- Relatively small subset of hearing loss patients
- Varying etiology and age of diagnosis
- Range of negative audiologic impacts
 - Localization
 - Speech understanding
 - Listening in noise





SSD Treatment

- Wide range of treatment options and clinical protocols
- Device options
 - CROS System
 - Bone anchored hearing device (BAHD)
 - Cochlear implant
- No device and regular audiologic monitoring



Etiology of SSD

- Most prevalent cause in children is cochlear nerve deficiency
- Followed by:
 - CMV infection
 - Mumps infection
 - anomalies of the inner ear
 - ANSD

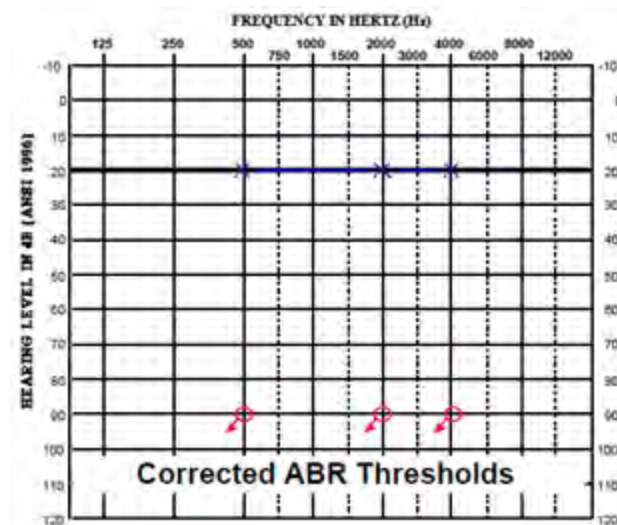
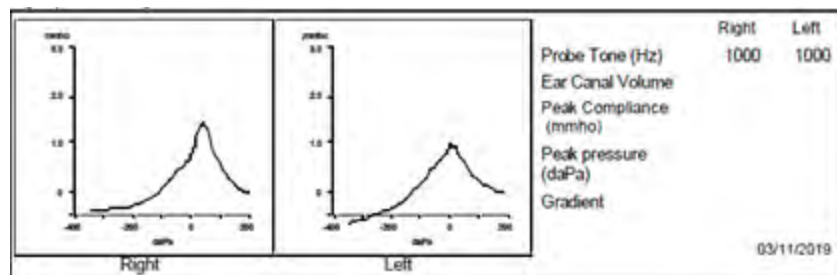
BAHD for Single-Sided Deafness

- BAHD worn near poorer ear, stimulates each cochlea

Improved Audibility	✓
Localization	✗
Binaural Hearing	✗
Ease of Access	✗

Meet Ari

- Diagnosed at 7 weeks of age with unilateral right hearing loss via ABR
- Born full term without complications and no family history of hearing loss in childhood
- Imaging revealed absent right cochlear nerve





Medical Management

- Highly motivate family interested in BAHA
- Little Ears: Critical range compared to normal hearing peers
- Ordered Cochlear BAHA 5 on soft band
 - Fit Ari at age 13 months
- Hearing support 2x/month via Early Intervention



BAHD Follow-up

- Family reported good device adherence
- New concerns for sensory behavior
 - Diagnosed with Autism Spectrum Disorder
- Would not tolerate device for aided behavioral testing
- Continued monitoring of better hearing ear
- 2 years since last audiology follow up

Snapshot of BAHD in our Clinic

- Smallest subset of SSD patients
 - ~5% of SSD patients that have been evaluated in the last 5 years
- Why?
 - Ease of device use and adherence
 - Aesthetics
 - Feedback

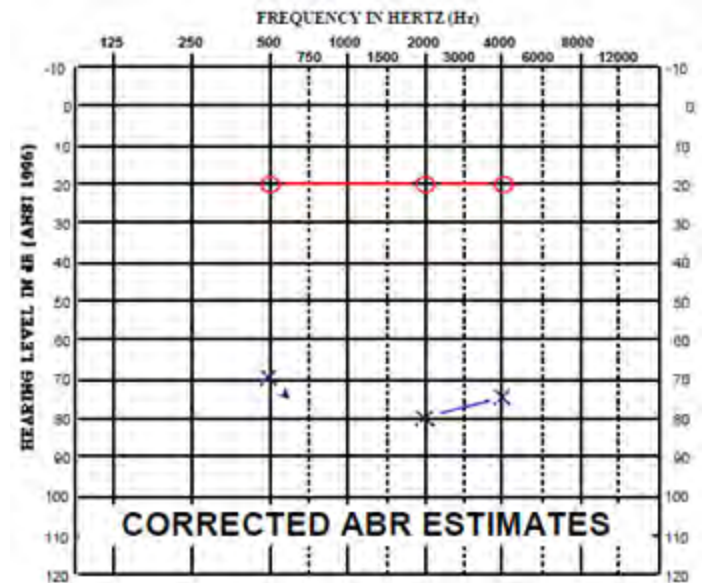
CROS for Single-Sided Deafness

- Devices worn on both ears, transmitter on poorer ear sends signal to better ear
- Awareness of sound from poorer hearing side
- Does not improve localization

Improved Audibility	✓
Localization	✗
Binaural Hearing	✗
Ease of Access	✓

Meet Ty

- Diagnosed with unilateral severe sensorineural hearing loss at 3 weeks of age via ABR
- CHARGE Syndrome
- Hearing loss progressed to profound SNHL





Medical Management

- Family initially interested in unilateral cochlear implant
 - Imaging revealed left severely hypoplastic cochlear nerve
- Opted for CROS system
 - Dispensed at age 6 years

BKB-SIN: Speech to left ear,
noise to right ear

Aided	eUnaided
4.7 dB SNR loss (mild SNR loss)	7.7 dB SNR loss (moderate SNR loss)

CROS Considerations in the Pediatric Population

- Age of first dispense
 - Style and durability
 - Positioning self in background noise
- Measurement of benefit
 - Speech in noise testing
 - Qualitative measures
- Collaboration with education colleagues

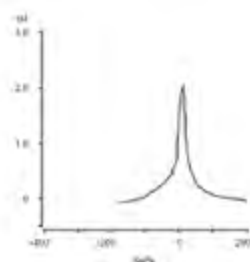
Cochlear Implant for Single-Sided Deafness

- Increasingly more common
- Variable success factors
 - Length of hearing loss
 - Anatomy
 - Motivation
- More cochlear implant centers available

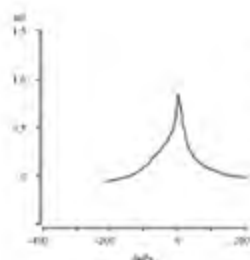
Improved Audibility	✓
Localization	✓
Binaural Hearing	✓
Ease of Access	✓

Meet Riley

- Passed NBHS
- No concerns from family
- Failed hearing screening at school
- Diagnosed at age 5 years
- MRI was unremarkable



Right

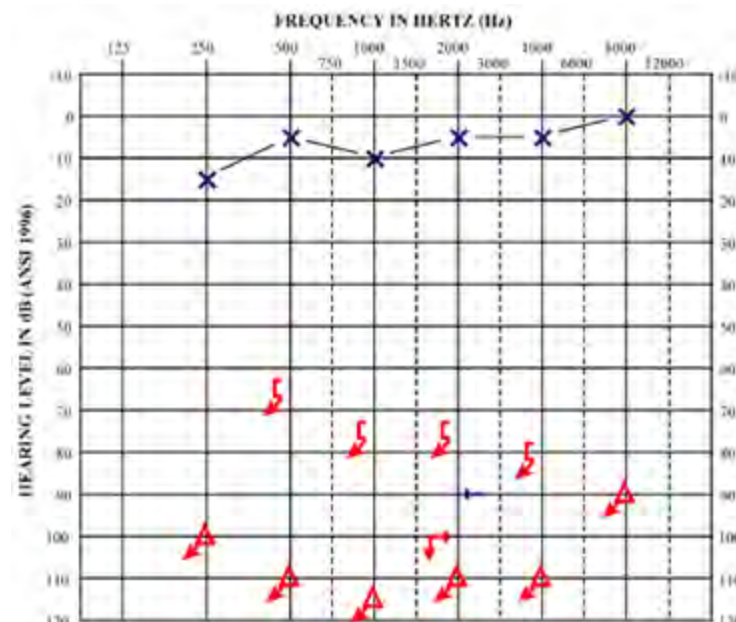


Left

Probe Tone (Hz)
Ear Canal Volume
Peak Compliance (mL)
Peak pressure (daPa)
Gradient

Right	Left
226	226
0.70	0.60
2.80	1.50
35	25

04/06/2021





Medical Management

- Trialed CROS system
 - Dispensed age 5 years
 - Performing well with CROS at school
- Family interested in Cochlear Implant
 - COSI-C
 - VFS-C

BKB-SIN Speech to right ear,
noise to left ear

Aided	eUnaided
1 dB SNR loss (normal range)	7 dB SNR loss (mild SNR loss)

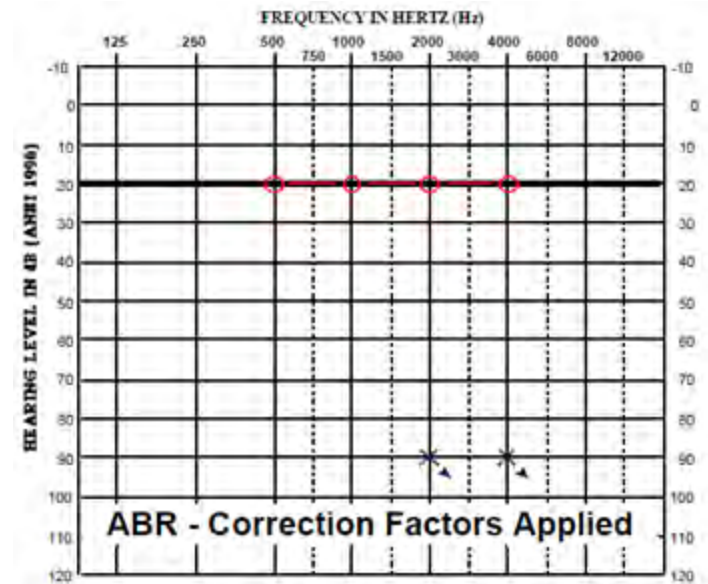


Medical Management

- Two denials from insurance company prior to surgery
 - Unilateral right implant at age 7 years
- Difficulty acclimating to device
 - Low wear time < 5 hours per day
- Inconsistent follow up

Meet Ellie

- Left hemisphere stroke and multiple seizures in first 24 hours of life
- Did not pass NBHS in left ear
 - Left profound SNHL
- Listening needs and goals



Transition to Adult Care with SSD



SECONDARY TRANSITION: THE BASICS



WHAT IS SECONDARY TRANSITION?

Secondary transition is the process of creating post-secondary goals for qualifying students and is required to be a part of a student's Individualized Education Program (IEP) beginning at age 14.

It involves a series of assessments designed to help facilitate a student's transition from school to adult life.

SECONDARY TRANSITION GOALS

A student's goals for secondary transition should be based on age-appropriate assessments, their interests, abilities, and needs. These goals must be updated annually. Transition goals are different from measurable annual IEP goals.



ADDRESSING GOALS

The student's IEP must address goal for:

- Education/Training
- Employment
- Independent living

Goals are based on current strengths/challenges, and what needs to be done for them to meet their goals.



EMPLOYMENT

A major factor for employment is based on the type of work a student wants after high school. This can include jobs beginning right after high school, or after college/a training program. Military service is also included here.

Employment considerations include:

- Career interests
- Jobs that fit with a student's skills
- Preferred environment/locations
- Any technical classes taken

Contacting your local vocational rehabilitation office may be helpful when considering career options.



EDUCATION AND TRAINING

A student's need for further education or training should be based on the skills needed to reach their employment goals.

This can include:

- + Technical college
- + 2 or 4 year college
- + Training program
- + Community based program

If a student plans on attending a college, try to schedule a visit to find out how classes are offered. (i.e. virtual, in-person, hybrid). Any supports a student requires to learn should also be considered.

INDEPENDENT LIVING

Independent living centers on where a student wants to live after high school and should be thought of as a spectrum.

This can look like:

- living on their own
- supervised housing
- living with their parents

Important consideration include:

- finances
- social/personal
- transportation
- advocacy
- medical/insurance

FOR MORE INFORMATION SCAN THE QR CODES BELOW



NAC Secondary Transition Information



PATH Secondary Transition Training Modules



Pennsylvania Secondary Transition Guide



Connecticut Secondary Transition



Sarah Meier 2022-2023 LEND Trainee
www.lend.qlt.edu





Tips for a Successful Transition

- Handing off to an adult audiologist
 - Nice to contact family and patient in same email, phone call or virtual visit
- Provided with audiometric and hearing aid information
 - Serial numbers and warranty information helpful in advance
 - Earmold information also a plus
- May need more hand holding as devices and choices are more complex
- Helps to start the process earlier
 - Example case will be very nice once patient ages out of our pediatric facility as they are already familiar with adult audiology services



Adults and SSD

- 345,064 people in the US have SSD (0.014% prevalence)
- Most prevalent among age 60-79
- More prevalent in women
- 27% of adults with SSD report good or excellent hearing
- Most common cause in adults is idiopathic sudden sensorineural hearing loss



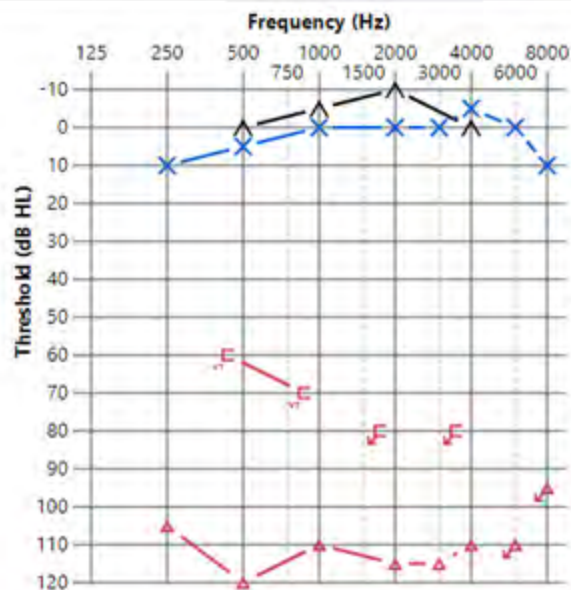
Meet Heather



Case History

- 20-year-old University Student
- Presents to ENT clinic with sudden right sided HL within 5 days of presenting to ER with same symptoms
- MRI IAC WNL in ER
- No remarkable medical history
- Also reports right sided tinnitus and intermittent dizziness over last 5 days

Audiogram



Speech Audiometry

Speech Threshold		Right Level	Right Mask	Left Result	Left Level	Left Mask
Material / Delivery	Result					
PTA	115 dB			2 dB		
2-freq PTA	dB					
SRT - Spondee - Record	NR dB	50 dB		4 dB		dB
SRT - Spondee - Record	90 dB	70 dB		dB		dB
Speech Recognition - Quiet		Right Level	Right Mask	Left Result	Left Level	Left Mask
Material / Delivery	Result					
Earphone - NU-6 rec - half	DNT %	dB		100 %	44	dB

Pure Tone Average

	AC (R)	AC (L)
3-freq	115	2

	125	250	500	750	1000	1500	2000	3000	4000	6000	8000
Left air:	10	5			0	0	0	-5	0	10	
Right air (masked):	105	120			110	115	115	110	110N	95N	
Mastoid bone:			0		-5		-10		0		
Right mastoid bone (masked):			60V		70V		80N		80N		



Medical Treatment

- High dose oral steroids and transtympanic steroid injections (x2)
- Audiogram essentially unchanged
- Discussed options including CROS, CI, OID, communication strategies

Listening Needs:

- Noisy social situations
- Classes
- Safety in busy city campus

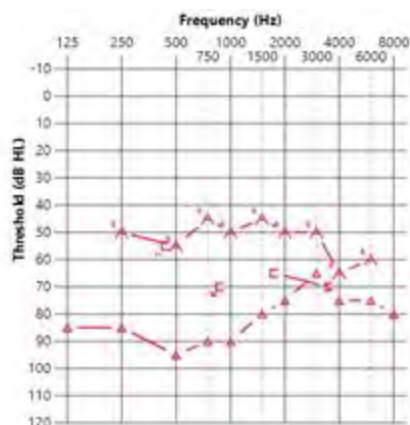
Treatment Decision:

- Tries CROS
 - Does not notice significant benefit
- Decides to discuss CI vs OID with Otology
 - Proceeds with CI candidacy evaluation

Cochlear Implant	
<u>Pro</u>	<u>Con</u>
Allows for hearing out of worse ear	Requires surgery
Improved audibility	Extensive recovery
Surgery and device may be covered by insurance	Frequent appointments
	Risks damage to hearing on implanted side

CI candidacy

Considered by Otologist to be an excellent surgical candidate meeting the FDA SSD criteria



Test A.

Summation Effect: Speech Front, Noise Front
AzBio Presented at 60 dB SPL @ SNR of +0: 52%
List # 98/133

Test B.

Head Shadow Effect: Speech Front, Noise to the side of the better ear
AzBio Presented at 60 dB SPL @ SNR of +0: 8%
List # 12/140

Test C.

Binaural Squelch: Speech Front, Noise to the side of the worse ear
AzBio Presented at 60 dB SPL @ SNR of +0: 91%
List # 125/137

Test D.

Spatial Release From Masking: is the score from Test B better than Test A? No

Soundfield Stimulus: warble tones
Speech Condition: recorded

CNC Words (50)				CNC Phonemes (150)			
L #	Cor/Tot	% Cor	SPL	L #	Cor/Tot	% Cor	SPL
1	0/50	0%	60	1	0/150	0%	60

AZ Bio Sentences					
L #	Cor/Tot	% Cor	SNR	SPL	
R 1	0/154	0%		60	
R 2	0/143	0%	+8	60	



Complications

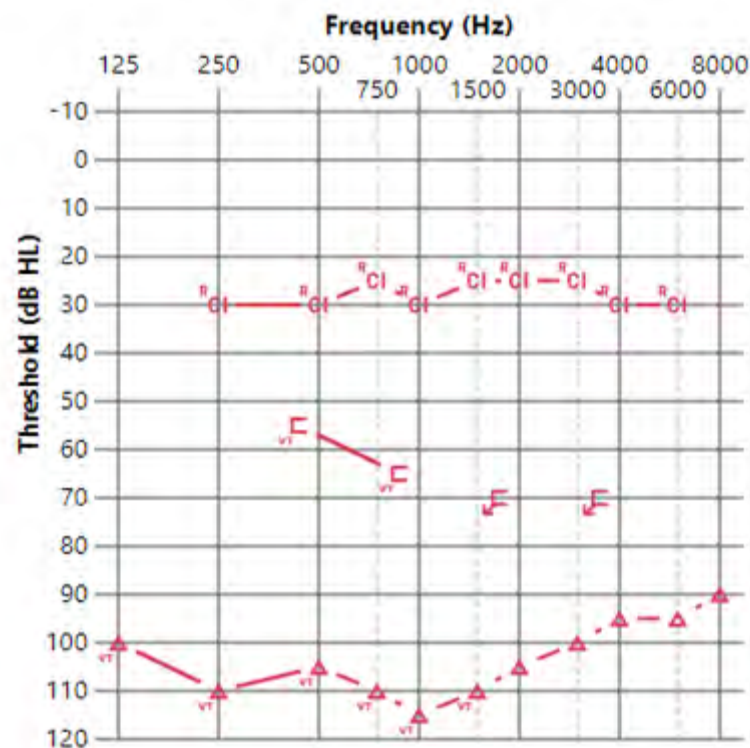
- Insurance
 - Denied approval for surgery
 - Family decided to pay self-pay rate
 - Ultimately appealed insurance denial
 - 3 appeals later decision was reversed

Activation

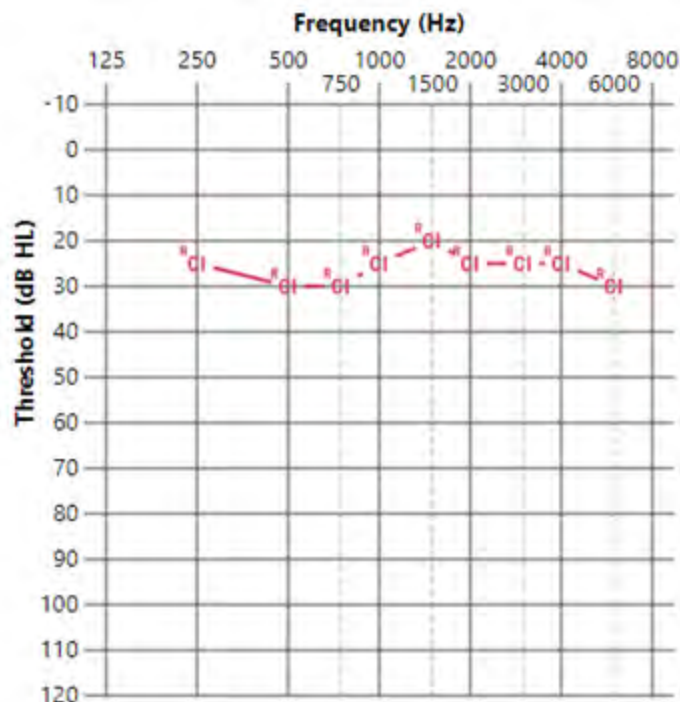
Test Condition: Warble tones

AZ Bio Sentences					
	L #	Cor/Tot	% Cor	SNR	SPL
R	1	109/154	71%		60
R	3	94/133	71%	+8	60

CNC Words (50)					CNC Phonemes (150)			
	L #	Cor/Tot	% Cor	SPL	L #	Cor/Tot	% Cor	SPL
R	1	14/50	28%	60	1	85/150	57%	60



3-month follow-up



AZ Bio Sentences					
	L #	Cor/Tot	% Cor	SNR	SPL
R	1	134/154	87%		60
R	2	59/143	41%	+5	60

CNC Words (50)					CNC Phonemes (150)			
	L #	Cor/Tot	% Cor	SPL	L #	Cor/Tot	% Cor	SPL
R	10	35/50	70%	60	1	128/150	85%	60

Summary: Patient reports she is hearing well. Magnet strength was reduced due to tightness. Patient will contact Cochlear for a lesser strength if needed. Scores are stable or improved since last evaluation. Coil site is unremarkable. Recommended patient follow up in 3 months or sooner if concerns arise.

6-month follow-up

- Patient reports adjusting well to CI and views it as "just another thing to put on like her contacts"
- Doing well with her college classes and enjoyed seeing a younger person with a CI on The Bachelor

AZ Bio Sentences					
	L #	Cor/Tot	% Cor	SNR	SPL
R	3	121/133	91%		60
R	4	78/146	53%	+5	60

CNC Words (50)					CNC Phonemes (150)			
	L #	Cor/Tot	% Cor	SPL	L #	Cor/Tot	% Cor	SPL
R	5	31/50	62%	60	1	120/150	80%	60

(1 month: 40%, 71%)(Initial Activation: 28%, 57%)(Pre-op: 0% words, 4% phonemes)

Test A.

Summation Effect: Speech Front, Noise Front

AzBio Presented at 60 dB SPL @ SNR of +0: 61% (1 month: 55%)(Pre-op: 52%)

List 7 85/139

Test B.

Head Shadow Effect: Speech Front, Noise to the side of the better ear

AzBio Presented at 60 dB SPL @ SNR of +0: 45% (1 month: 92%*)(Pre-op: 8%)

List 8 88/145

*Likely error in speaker set up

Test C.

Binaural Squelch: Speech Front, Noise to the side of the worse ear

AzBio Presented at 60 dB SPL @ SNR of +0: 92% (1 month: 89%)(Pre-op: 91%)

List 9 127/138



Adult CI

- Take aways from Heather
 - CI can be very worth it for SSD patients
 - even if they might have to pay out of pocket
 - Be flexible and willing to try more than 1 option
 - Support System matters
 - Consider educational accommodations through university office of disabilities



Meet Tracy



Case History

- 61 year old female
- Presenting post hospitalization to ENT Clinic
- Hospitalized for Lower Leg Sepsis
 - Treated with Lasix and Vancomycin
 - Noticed right sided HL once discharged

ENT visit is 2 months post hospitalization and hearing change

Audiogram

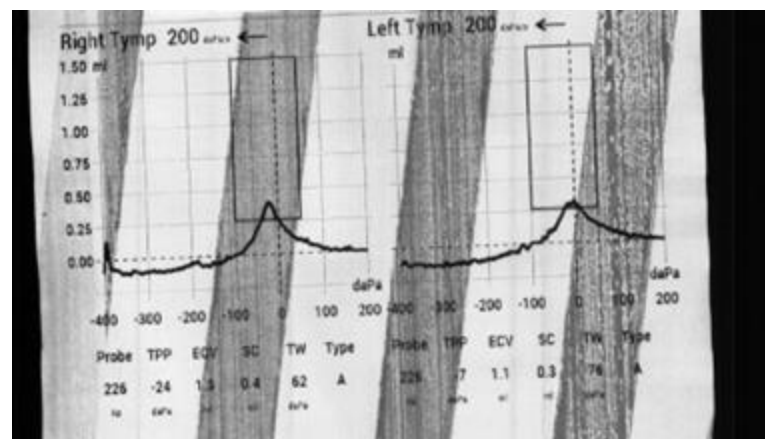
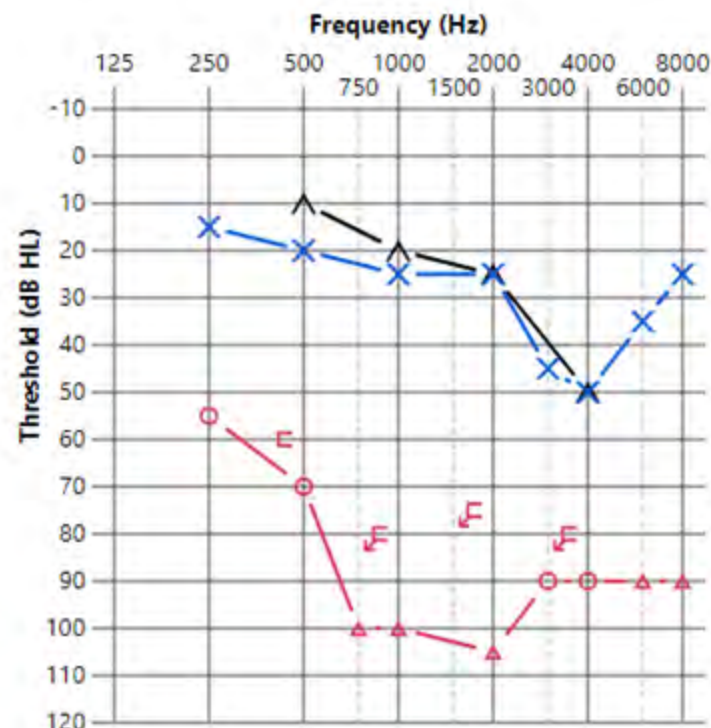
Speech Audiometry

Speech Threshold

	Material / Delivery	Right Result	Right Level	Right Mask	Left Result	Left Level	Left Mask
PTA		92 dB			23 dB		
Σ Freq PTA		dB			dB		
SRT- earphones	Spondee - Record	100 dB		dB	30 dB		dB
SAT	Spondee - Record	NR dB		70 dB	dB		dB

Speech Recognition-Quiet

	Material / Delivery	Right Result	Right Level	Right Mask	Left Result	Left Level	Left Mask
Earphone	NU-6 rec half	0 %	104	70 dB	100 %	70	dB
Earphone	NU-6 rec half	%		dB	%		dB





Listening Needs:

- Hearing family
- Safety Concerns living alone
- Hearing dogs to take care of them





Treatment Decision:

- Patient wanted improved hearing
 - Reported understanding of CROS limitations
 - Good insurance coverage for hearing aids
- Patient did not want
 - More surgery
 - More hospital time

Decided on CROS System



Considerations when choosing a CROS device:

- Battery life
 - Rechargeable vs Disposable
 - Is the priority ease of use or being able to last for a full day of use?
- App Compatibility
 - How does the App work with the HA and CROS?



Adult CROS Device

- Tracy was helped by motivation and realistic expectations
 - Did not want surgery
 - Very satisfied with this non-surgical/less medical option
 - Met her basic listening needs of:
 - Family
 - Dogs
 - Safety



Meet Paula

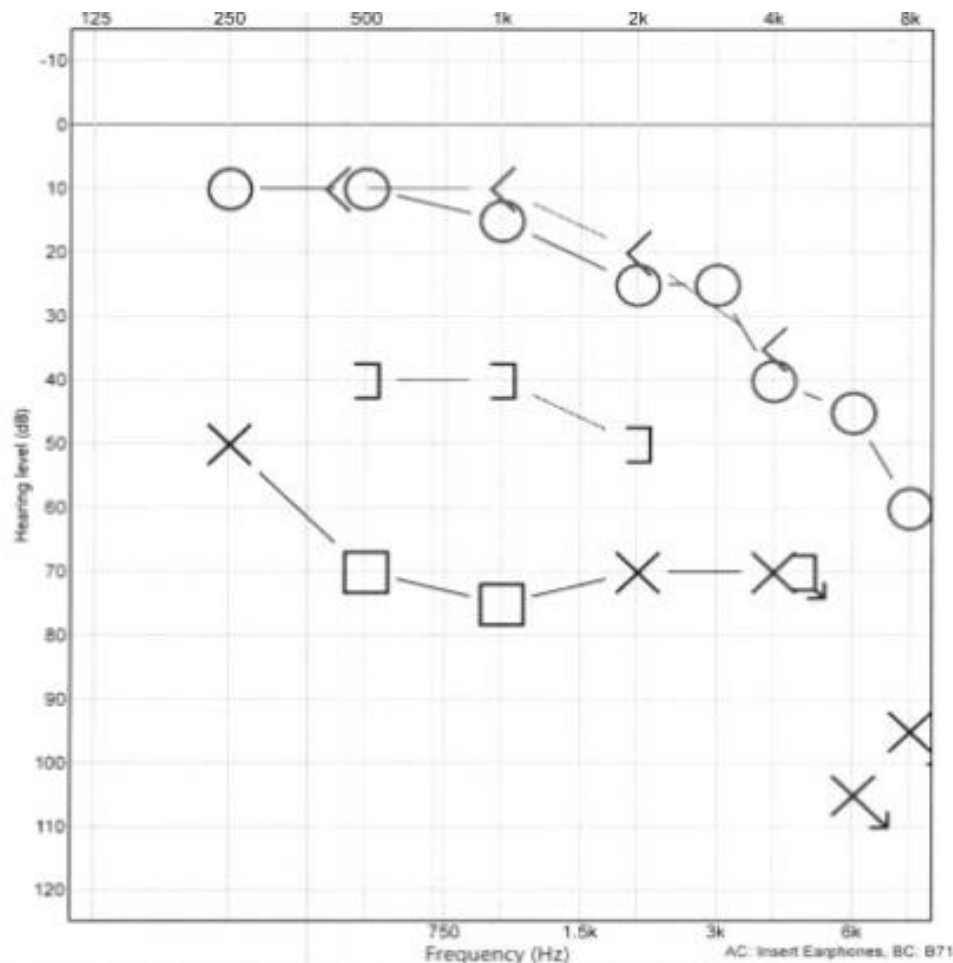


Case History

- Longstanding left SNHL since childhood
- Works as an ASL interpreter
- No remarkable otologic symptoms

Audiogram

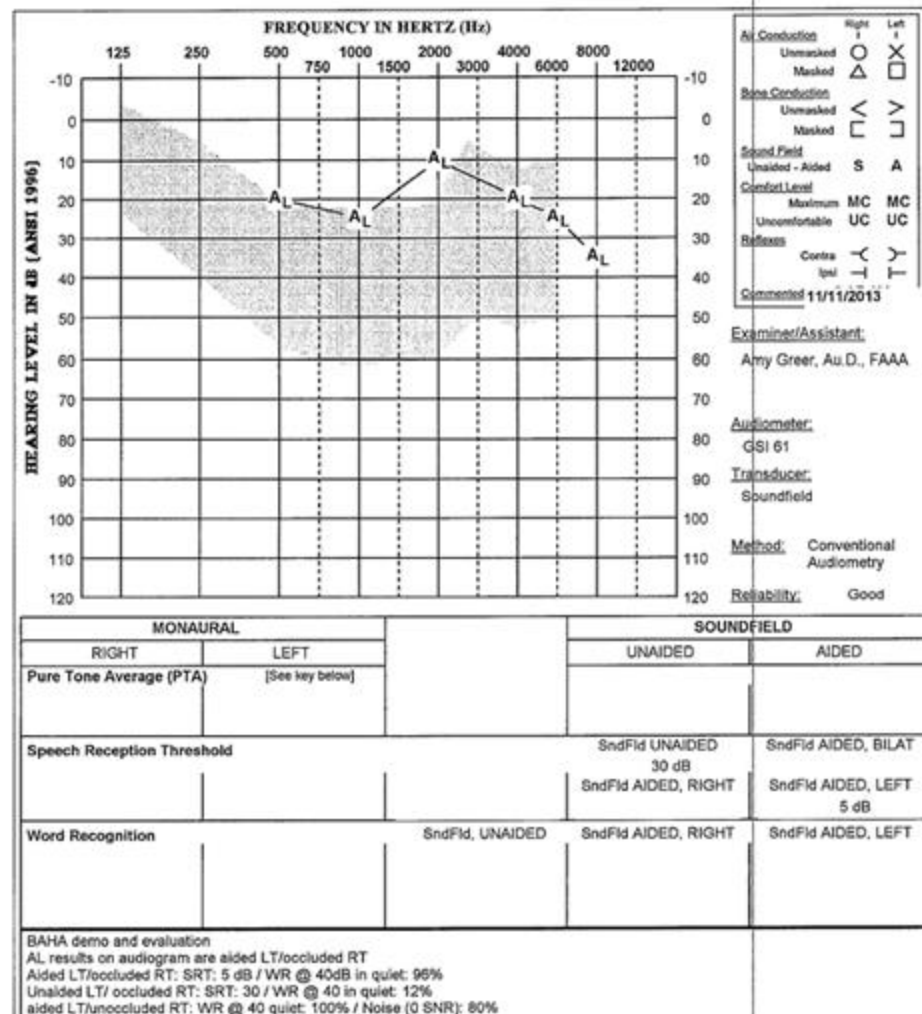
(10 years ago)



Speech	SDT		SRT		WRS / SRS 1				WRS / SRS 2				MCL		UCL	
	dB HL	[m]	dB HL	[m]	%	dB HL	[m]	S/N	%	dB HL	[m]	S/N	dB HL	[m]	dB HL	[m]
Right			20		100.0	60										
Left			90		CNT	CNT	CNT	CNT								
Bin																
Note	¹ NU No. 6 CNC List 1A								² NU No. 6 CNC List 1A							

10 years ago:

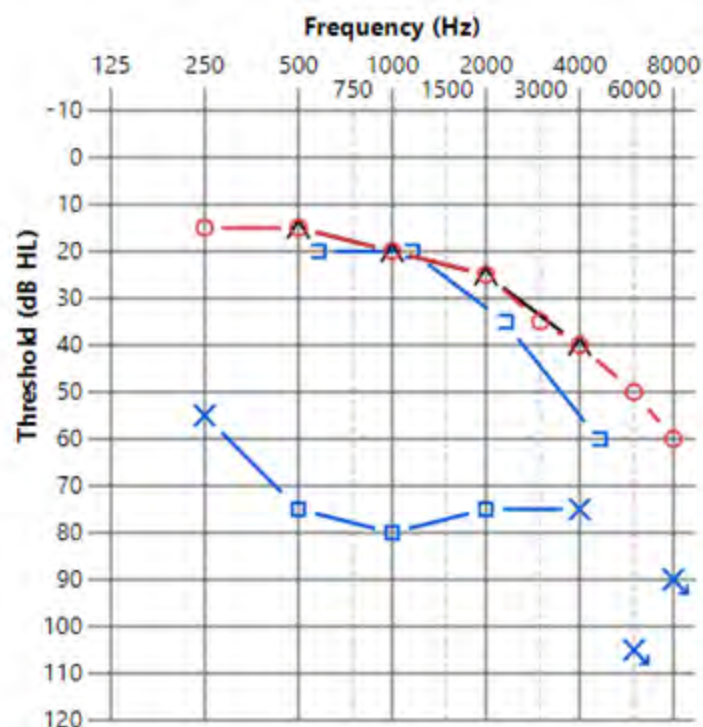
- Considered CROS vs BAHA
- Demoed both in office
 - Pt felt they performed better with BAHA especially in noise
- Surgery went well
- Successful with BAHA



On to the present day:

- Issues with recurrent infection around BAHA post
 - Pain
 - crusting
- Interested in other options
 - CROS
 - OSIA
 - Not interested in CI

Pre-Op Audio



Speech Audiometry

Speech Threshold

	Material / Delivery	Right Result	Right Level	Right Mask	Left Result	Left Level	Left Mask
PTA		20 dB			77 dB		
2 Freq PTA		dB			dB		
SRT-earphones	Spondee - Record	26 dB		dB	dB		dB
SAT	Spondee - Record	dB		dB	60 dB		55 dB

Speech Recognition-Quiet

	Material / Delivery	Right Result	Right Level	Right Mask	Left Result	Left Level	Left Mask
Earphone	NU-6 rec half	100 %	66	dB	0 %	100	70 dB

Masking (dB HL)



55

55

65



60

65

70

90



Treatment Plan

- Treatment needs to:
 - Improve conversation in noise
 - Decrease infections
 - Improve comfort
- Remove BAHA post
- Switch to OSIA

Adult Osseointegrated Device

Lessons from Paula:

- Personal Preferences matter
- Comfort matters
- Needs change over time
- Improved treatment outcomes can be worth traveling to achieve

Bone Conduction System	
<u>Pro</u>	<u>Con</u>
Improved audibility	May require Surgery
Surgery and device may be covered by insurance	Does not improve hearing on worse ear
Can demonstrate in office	Recovery time from surgery
	Harder to access Care



So How do you solve a problem like SSD?

- Patient and Family Directed Care
- Realistic expectations and excellent counseling
- Be familiar with all the options
 - Know when and where to refer if you don't offer all

SSD Handout

Pros and Cons

Hearing Aid		CROS/BiCROS	
<u>Pro</u>	<u>Con</u>	<u>Pro</u>	<u>Con</u>
Does not require surgery	Does not improve hearing on worse ear	Does not require surgery	Does not improve hearing on worse ear
Improved audibility	May not be covered by insurance	Improved audibility	May not be covered by insurance
Easy to proceed		Awareness of sound from worse side on good side	Sound quality might not sound natural
Easy access to care		Easy access to care	
Bone Conduction System		Cochlear Implant	
<u>Pro</u>	<u>Con</u>	<u>Pro</u>	<u>Con</u>
Improved audibility	May require Surgery	Allows for hearing out of worse ear	Requires surgery
Surgery and device may be covered by insurance	Does not improve hearing on worse ear	Improved audibility	Extensive recovery
Can demonstrate in office	Recovery time from surgery	Surgery and device may be covered by insurance	Frequent appointments
	Harder to access Care		Risks damage to hearing on implanted side

Resources for More Information:

American Cochlear Implant Task Force Guidelines for SSD:

<https://profiles.wustl.edu/en/publications/american-cochlear-implant-alliance-task-force-guidelines-for-tin>

FDA Cochlear Implant Information: <https://www.fda.gov/medical-devices/implants-and-prosthetics/cochlear-implants>

Hearing Tracker CROS/BiCROS informational site: <https://www.hearingtracker.com/hearing-aids/cros-and-bicros>

Single Sided Deafness and Bone Conduction: <https://www.audiology.org/bone-conduction-devices-for-single-sided-sensorineural-deafness/>

Snapp, H. A., & Ausili, S. A. (2020). Hearing with One Ear: Consequences and Treatments for Profound Unilateral Hearing Loss. *Journal of clinical medicine*, 9(4), 1010. <https://doi.org/10.3390/jcm9041010>



Questions?

Virginia Milne, AuD

Melanie Lutz, AuD



Thank you for attending!

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