Bone Anchored Hearing System (BAHS) Candidacy and Evaluation of the Adult Patient

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This course will provide an overview of the candidacy criteria, evaluation process, and post-operative follow up for patients pursuing a BAHS. We will also briefly discuss some of the data on our single-sided deafness (SSD) study currently being conducted at Michigan Ear Institute.

Introduction

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Agenda

- BAHS Overview
- Candidacy
- Evaluation Process
- Fitting
- Follow-Up
- Single-Sided Deafness (SSD) Research

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Outcomes

- At the end of this course, participants will be able to:
  - List the main components of a BAHS
  - Discuss the candidacy criteria for a BAHS
  - Discuss the difference between a percutaneous and transcutaneous system
  - List at least three things that should take place during the evaluation process of a potential BAHS candidate

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BAHS Overview

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- How bone conduction hearing works
  - Bypassing the outer and middle ear
- BAHS
  - Processor picks up sound
  - Changes it into vibration
  - Vibrations travel through the bones in the skull
  - Vibrations picked up by the cochlea as sound
- Osseointegration

Bone Conduction Hearing

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- Direct drive
  - Transmission of sound ***directly to the skull*** from the processor via an abutment
    - Oticon Ponto
    - Cochlear BAHA Connect
- Skin drive
  - Vibrations transmitted ***across the skin*** to the skull
    - Cochlear BAHA Attract
- Direct drive → most efficient transfer of the two
- Osia
  - Piezoelectric transducer

Types of Bone Anchored Devices

Iseri M, Orhan KS, Tuncer U, et al. Transcutaneous Bone-anchored Hearing Aids Versus Percutaneous Ones: Multicenter Comparative Clinical Study. Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology. 2015 Jun;36(5):849-853.

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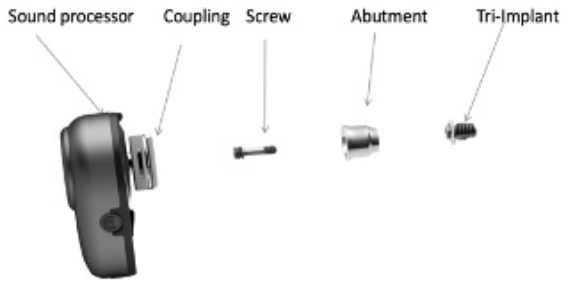
- Components of a BAHS
  - Processor
  - Coupling
  - Screw
  - Abutment
  - Implant



Samra, B. (2018, April). Bone anchored hearing systems - principles and candidacy. AudiologyOnline, Article 22366. Retrieved from www.audiologyonline.com

BAHS Components

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Candidacy

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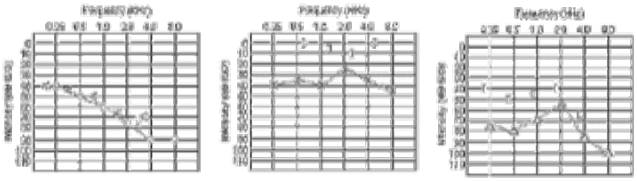
- Single-sided deafness (SSD)
- Conductive hearing loss (CHL)
- Mixed hearing loss (MHL)



Types of Hearing Loss

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SSD	CHL/MHL
Congenital	Otitis Media
Acoustic Neuroma	Otosclerosis
Viral Infection	TM Perforation
Meniere's Disease	Microtia
	Atresia

Potential Causes of Hearing Loss in BAHS Candidates

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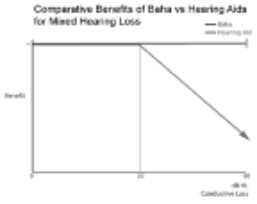
- Bone conduction average at or better than 65dB HL
  - 500 Hz
  - 1k Hz
  - 2k Hz
  - 3k Hz



O'Sullivan, M., 2019. *Foundations Of BAHA Implants: Candidacy*. [online] Audiology Online. Available at: <https://www.audiologyonline.com/articles/foundations-of-baha-implants-candidacy-25450>

- ABG ≥ 30dB HL
  - The larger the ABG, the more likely it is that a BAHS will tend to outperform a HA

Audiometrics – CHL/MHL

de Wolf, M. J., Hendrix, S., Cremers, C. W., & Snik, A. F. (2011). Better performance with bone-anchored hearing aid than acoustic devices in patients with severe air-bone gap. *The Laryngoscope*, *121*(3), 613-616.
Snik, F. M., Mylanus, E. A., Proops, D. W., Wolfaardt, J. F., Hodgetts, W. E., Somers, T., ... & Tjellström, A. (2005). Consensus statements on the BAHA system: where do we stand at present?. *Annals of Otology, Rhinology & Laryngology*, *114*(12_suppl), 2-12.

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- Bilateral is best [when candidacy criteria is met]
  - Binaural summation
  - Improved speech in noise understanding
  - Assistance in sound localization
- Bilateral Fitting
  - Best if the BC thresholds are symmetrical
    - <10dB HL on average
    - <15dB HL at individual frequencies
- Unilateral Fitting
  - Choose the side with the best BC thresholds

Unilateral or Bilateral?

Priwin C, Stenfelt S, Granström G, Tjellström A, Håkansson B. Bilateral bone-anchored hearing aids (BAHAs): an audiometric evaluation. *Laryngoscope*. 2004;114(1):77-84. doi:10.1097/00005537-200401000-00013

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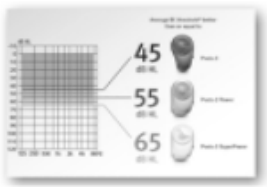
- Healthy ears AC thresholds
  - Traditionally, PTA better than or equal to 20 dB HL
    - 500 Hz
    - 1000 Hz
    - 2000 Hz
    - 3000 Hz



- Unconventional recipients
  - Poorer performance on SIN tasks
  - Similar perceived benefit (improved QoL)

Audiometrics – SSD

Schwartz, Seth & Kobylk, Deborah. (2016). Outcomes of Bone Anchored Hearing Aids (BAHA) for Single Sided Deafness in Nontraditional Candidates. Otology & neurotology: official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology. 37. 1608-1613. 10.1097/MAO.0000000000001225.

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BAHS Advantages

- BAHS
  - Low gain
  - Open ear canal
  - Comfortable
  - Single unit
  - Less programming

- Traditional HA
  - High gain
  - Occlusion

- CROS Device
  - Two units
  - Filtered sound

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Evaluation

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- Demonstration
- *Sound field testing
  - Currently, research patients only
- Device selection
- Counseling

Evaluation Outline

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- Test band/soft band/test rod
- In office demonstration
- Extended trial
- BC Direct
  - Best (if possible)
- Pre-Programmed
  - P1 - CHL
  - P2 - MHL
  - P3 - SSD

Demonstration

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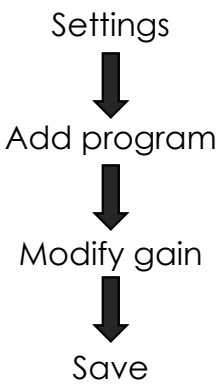
- CHL
  - BC thresholds of 10-15dB
- MHL
  - Add overall gain (~5 units)
- SSD
  - Add high-frequency gain (~5 units)



Example Demo Settings

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- Unaided vs. aided testing in the SF
  - NU6
  - AzBio
    - Quiet
    - Noise
  - QuickSIN
- Largest benefit seen when noise is towards the good ear and speech is towards the bad

Sound Field Testing

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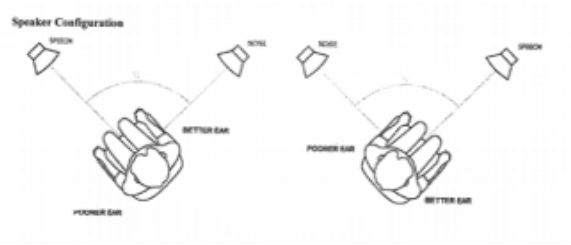
	Speech (dB HL)	Noise (dB HL)	SNR (dB)
Sentence 1	50	25	25
Sentence 2	50	30	20
Sentence 3	50	35	15
Sentence 4	50	40	10
Sentence 5	50	45	5
Sentence 6	50	50	0



Example Testing Conditions

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- "Audiologists may report CPT codes 92626 and 92627 when evaluating the auditory function of a patient either before or after the patient receives a unilateral or bilateral hearing device(s)"
- **92626:** Evaluation of auditory function for surgically implanted device(s) candidacy or postoperative status of a surgically implanted device(s); first hour
  - At LEAST 31 minutes of evaluation
    - Testing and counseling
- **92627:** Each additional 15 minutes
- **92700:** Unlisted otorhinolaryngological service or procedure

Billing for the Evaluation

Coding For Evaluation Of Auditory Rehabilitation Status
https://www.asha.org/Practice/reimbursement/coding/Coding-for-Evaluation-of-Auditory-Rehabilitation-Status/

New and Revised CPT Codes For 2020/

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- Perceived benefit
- SF testing results
- Surgical options
  - Oticon ponto
  - Cochlear BAHA
    - Connect
    - Attract
  - Osia
- Traditional hearing aid(s)
- CROS unit

Device Selection

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- Determine goals for treatment
- Discuss realistic expectations
- Combination of formal and informal methods
  - Formal assessments
    - COSI
    - APHAB
- Review the timeline

Counseling

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Post-Operative Follow Up

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- ~6 weeks post-op
- BAHS delivery appointment
  - 1 hour long

- Site check
- BC direct
- Programming/gain adjustments
- Accessory pairing
- Kit overview
- Practice using the processor

BAHS Orientation

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SSD Study at MEI

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- Device selection

- Hearing Handicap Inventory for Adults (HHIA)
- Tinnitus Handicap Inventory (THI)
- Survey on Treatment Choices in SSD
  - 25 item "device selection" questionnaire
  - Likert rating
    - Strongly disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly agree

Current Research - SSD

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- Device treatment vs. no device
  - Statements relate to motivation and perceived level of hearing handicap
    - "I feel handicapped by my SSD"
- BAHS vs. CROS
  - Statements relate to differences between the device categories (surgical vs. nonsurgical)
    - "I am willing to wear devices on both ears"
- Characteristics of the device model
  - Statements relate to cosmetics, functionality, and connectivity
    - "I want a device with a rechargeable battery"

Device Selection Survey

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- "The sound quality of the device is more important to me than how it looks and feels"
- "I am highly motivated to use a hearing device to treat my SSD"
- I want to experience no discomfort from wearing the hearing device"
- "I want a device that is extremely easy to use (on/off, changing batteries, volume control, etc."
- "I want to be fit with a device as soon as possible"
- "I expect excellent customer service from the company that manufacturers my hearing device"
- "The advice of my counseling clinicians (physician, audiologist) is the most important factor when deciding on a device"
- "I worry about losing my hearing (or more hearing) in my better ear"

- HHIA → Q1
  - "I feel handicapped by my SSD"
- THI → Q17
  - "Relief from my tinnitus is my main motivation for seeking treatment"

Preliminary Analysis

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