Cochlear Implants & BAHA
Candidacy, Criteria, & Outcomes

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Cochlear Implants
An Overview
The cochlear implant basics

Two components of a cochlear implant:
The cochlear implant basics

Two components of a cochlear implant:

1. An internal implant placed just under the skin, behind the ear.
The cochlear implant basics

Two components of a cochlear implant:

1. An internal implant placed just under the skin, behind the ear
2. And an external sound processor
How a hearing aid works
How a cochlear implant works
Current look at cochlear implant candidacy
Adult candidacy criteria – cochlear implant

Audiometric candidacy ranges
Moderate-to-profound SNHL in both ears

Speech recognition criteria*

Limited benefit from amplification defined as preoperative test scores:
≤50% sentences in ear to be implanted
≤60% bilaterally (best aided condition)

*HINT or other test material typically presented @ 60 dB SPL
Pediatric candidacy criteria – cochlear implant

Audiometric candidacy ranges:

2-17 y.o. - severe-to-profound SNHL in both ears

12-24 mos. – profound SNHL in both ears

Speech recognition criteria*

2-17 yrs: Limited benefit from binaural amplification trial with MLNT/LNT scores ≤ 30%

12-24 mos: Limited benefit from binaural amplification trial

*Test material typically presented @ 60 dB SPL
Predicting success

Adult considerations:
- Onset of deafness
- Duration of deafness
- Mode of communication
- Commitment/motivation to getting a cochlear implant

Pediatric considerations:
- Age of the child at implantation
- Aural (re)habilitation
- Family commitment
Contraindications

- Deafness due to lesions of the acoustic nerve or central auditory pathway
- Active middle ear infection
- Absence of cochlear development
- Tympanic membrane perforations in the presence of active middle ear disease
Other considerations

- Psychological contraindications
- Medical contraindications to surgery
- Unrealistic expectations
- Disabilities that limit participation in (re)habilitation
Case study - 52 y.o. female, progressive SNHL, CI-R

Pre-op

<table>
<thead>
<tr>
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<th>Aided Scores*</th>
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<tr>
<td>HINT</td>
<td>12%</td>
</tr>
<tr>
<td>CUNY</td>
<td>19%</td>
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<tr>
<td>CNC</td>
<td>0%</td>
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Post CI

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<tr>
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<th>Scores</th>
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<tbody>
<tr>
<td>HINT</td>
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<tr>
<td>CUNY</td>
<td>92%</td>
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<tr>
<td>CNC</td>
<td>78%</td>
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Note: Left side is dead ear

*Performed in best aided condition
Case study - 63 y.o. male, noise exposure + progressive SNHL, right CI

Pre-op best aided

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<td>12</td>
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<tr>
<td>HINT-Q* %</td>
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<td>20</td>
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Post-op (6 mos)

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<td>DNT</td>
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<tr>
<td>HINT-Q* %</td>
<td>100</td>
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<tr>
<td>HINT N#</td>
<td>82</td>
<td>DNT</td>
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*60dB SPL #+10/SNR

A – AU Aided SF
C - CI right ear
Bone AD = NR
Case study - 29 y.o. female, progressive SNHL, bilateral CI

Pre-op best aided

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<td>HINT-Q* %</td>
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<td>28</td>
<td>31</td>
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*60dB SPL

Post-op (6 mos)

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<td>HINT N#</td>
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<td>89</td>
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#+10/SNR

A - right aided      A - left aided
C - CI right ear     C - CI left ear
Bone conduction = NR
Are cochlear implants reliable?

• All cochlear implant manufacturers report device failures in accordance with the International Standard ISO 5841-2:2000 & the principles described in the European & Global Consensus on Cochlear Implant Failures & Explantations.

• The Cumulative Survival Percentage Rate for registered implants worldwide is 98.8% within 7 years for the Nucleus CI24RE device.

• The Cumulative Survival Percentage for registered implants worldwide for registered implants worldwide is 98.1% within 12 years for the Nucleus CI124R.

• The Cumulative Survival Percentage for registered implants worldwide is 96.9% within 15 years for the Nucleus CI124M.
Performance Take Away

- 25 years ago, average word recognition scores with early generation cochlear implants were less than 20%\(^1\)
- Today, sentence recognition scores exceed 80% in quiet (HINT scores)\(^2\)

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Sam 13 months old - 19 days post activation. No CI, No hearing aid
Hearing Aid only
Hearing Aid + Cochlear implant
Sam talking – 1 year post activation
1 year post activation - listening game
Sam talking- 4 years Post activation
The Cochlear™ Baha® System
The Baha® System
The Baha® System

FDA Indication Criteria for Implantation

Mixed and Conductive Hearing Loss

• ≥ 5 years of age

• ≤ 65 dB HL BC PTA

• For bilateral fitting - Symmetric bone conduction thresholds are defined as less than 10 dB difference on average (0.5, 1, 2, and 3kHz) or less than 15 dB at individual frequencies.
Key Indications for Baha® System

1. Conductive Loss
2. Mixed Loss
3. Single Sided Deafness (SSD)
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Key Indications for Baha® System

1. Conductive Loss
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3. Single Sided Deafness (SSD)
Mixed and Conductive Hearing Loss

Possible causes:

- Chronic otitis media (ear infections)
- Congenital atresia
- Cholesteatoma
- Middle ear dysfunction/disease
- External otitis
Air/bone gap > 30 dB?
Baha® System outperforms hearing aids

As the air/bone gap increases, hearing aid performance decreases. Baha performance is not affected.

The Baha® System
Bilateral Conductive Hearing Loss

Bilateral conductive hearing loss with normal inner ear function.
Diagnosis example: Bilateral microtia
Conductive ‘Aided’ Outcomes
The Baha® System
Bilateral Mixed Hearing Loss

Bilateral mixed hearing loss

Diagnosis example:
- right ear – cholesteatoma operation
- left ear – chronically draining
Single Sided Deafness

Possible Causes:

- Acoustic neuroma tumors, other surgical intervention
- Sudden deafness
- Neurological degenerative disease
- Trauma
- Ototoxic treatments
- Genetics
- Meniere’s Disease
The Baha® System

FDA Indication Criteria for implantation

*Single Sided Deafness*

- $\geq$ 5 years of age
- Normal hearing in contralateral ear
  - Normal hearing is defined as PTA AC threshold equal to or better than 20 dB at .5, 1, 2 and 3kHz.
- Functions by transcranial routing of the signal
Single Sided Deafness (SSD)

- **Purpose**
  - To provide sufficient amplification force to overcome the head transfer function

- **Additional force may be required to**;
  - Overcome large head transfer function
  - Compensate for sensorineural hearing loss (if loss develops due to ageing or some other natural process later in life)

- **Common difficulties adults with SSD experience**
  - Hearing in background noise
  - Localization
  - Understanding a person situated on the deaf side

- **Common Experiences of children with unilateral hearing loss**¹
  - Speech and language delay
  - Difficulty paying attention in school
  - Difficulty hearing in noisy environments
  - Difficulty localizing sounds

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Head Shadow Effect

-3 dB Head Shadow Effect

High frequency

Low frequency
Solution with Baha®

Baha Reduces Head Shadow Effect
SSD ‘Aided’ Outcomes

Unaided Audiogram

Aided Audiogram
Baha® Implant with Abutment
Baha® Sound Processor
Overview of Baha® Surgery
Pre-operative test equipment

Test rod

Test headband
Surgery basics

- Surgical procedure is straight-forward, lasting about an hour
- One or two stage surgery depending on patient’s age and bone integrity
- Outpatient procedure
- Adult surgeries can be done under local anesthesia
- Sound Processor fit after osseointegration
General patient concerns

- After abutment site is healed the patient may:
  - Bathe or shower (without the sound processor)
  - Swim
  - Engage in most sports activities while protecting the sound processor (if needed)
  - Engage in contact sports, as long as the abutment is protected (w/o sound processor)

- Some patients experience some numbness around the abutment site, the extent of which can diminish with time
Surgical steps

1. Mark site
2. Create flap and reduce tissue
3. Drill and implant fixture
Baha® Softband for children < 5

Softband can also be used by adults if indicated or for demo/trial.
Baha® take home messages

- Baha is a bone anchored auditory prosthesis
- The new Cochlear™ Baha 3 Family of Sound Processors have many of the same features as high end hearing aids
- Outperforms air conduction aids when air/bone gap exceeds 30 dB¹
- Excellent choice for treatment of SSD

Discussion

• Questions?

THANKS FOR YOUR ATTENTION!