Trends in Bone Conduction: Considerations for Treating Both Ears
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Agenda
• Introduction
• Clinical benefits of bilateral Baha systems
• Baha system candidacy
• Bilateral features of the Baha 5 Sound Processor
• Bilateral fitting considerations

Learner Outcomes
• List the potential benefits of bilateral Baha fittings
• List the candidacy criteria for bilateral Baha fittings and describe the most appropriate candidates for this type of fitting
• Describe the features in Baha Fitting Software that support bilateral fittings for Baha recipients
Using Bone Conduction to Treat Hearing Loss

Conductive and Mixed Hearing Loss  Single-Sided Deafness

Baha® Systems

Baha Connect  Baha Attract  Non-Surgical

Getting the Best Outcomes for Patients

For decades, treating people with bilateral hearing loss with two hearing aids has been the standard of care. The benefits are well established, and providing just one hearing aid to these people seems counterintuitive to most.

But what about bone conduction?

Sources: Baha Connect, Baha Attract, Non-Surgical data; source data is on file. Cochlear Bone Anchored Solutions AB.
Clinical Benefits of Bilateral Baha® Systems

VIDEO

Improved ability to localize sounds* // Improved hearing in noise* // Improved audibility and patient satisfaction*

* Compared to a unilateral fitting. References available on slides that follow.

The Clinical Evidence
**Improved Ability to Localize Sounds**

Several studies demonstrate clear localization benefits when comparing a unilateral bone conduction fitting to a bilateral fitting. 1-3

![Diagram](image1.png)

Bilateral patients are able to localize sound within 30° 9 times out of 10. Unilateral patients are close to chance level.


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**Improved Hearing in Noise**

Available clinical evidence suggests that a two ear approach leads to improved hearing in noise. 1-3

![Diagram](image2.png)

Up to 3.1 dB improved SNR when going from a unilateral to bilateral fitting. 1

<table>
<thead>
<tr>
<th>Study</th>
<th>Mean improvement in SNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bosman et al. 2</td>
<td>2.5 dB (sound and noise separated)</td>
</tr>
<tr>
<td>Priwin et al. 3</td>
<td>3.1 dB (sound and noise separated) 2.8 dB (surround sound)</td>
</tr>
</tbody>
</table>

*Note: SNR = Signal-to-Noise Ratio*

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**Improved Audibility**

A bilateral fitting of a bone conduction solution provides a summation effect. This will improve the dynamic range and speech perception in quiet. 1

![Diagram](image3.png)

Up to 5.4 dB summation effect when going from a unilateral to bilateral fitting.

<table>
<thead>
<tr>
<th>Study</th>
<th>Mean improvement in SRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bosman et al. 2</td>
<td>4.0 dB (P &lt; .001)</td>
</tr>
<tr>
<td>Hamann et al. 3</td>
<td>4.0 dB</td>
</tr>
<tr>
<td>Priwin et al. 4</td>
<td>5.4 dB (P = .001)</td>
</tr>
</tbody>
</table>

*Note: SRT = Speech Reception Threshold*
Improved Patient Satisfaction

Recipients express satisfaction and increased quality of life when receiving their bilateral bone conduction implant.

<table>
<thead>
<tr>
<th>Study</th>
<th>Bilateral</th>
<th>Unilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number in study</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Regression rate</td>
<td>90%</td>
<td>80%</td>
</tr>
<tr>
<td>Confidence interval</td>
<td>25-42</td>
<td></td>
</tr>
<tr>
<td>Benefits scores of bilateral vs unilateral bone conduction implants (BAHAs)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Clinical studies on bilateral benefits


Consensus Meeting

In May, 2019, a panel of leading experts in the field of bone conduction convened a consensus on the benefits of bilateral fitting of bone conduction devices.

Adult candidacy

"Bilateral fitting facilitates improved localization ability, improved hearing in quiet and in noise, both in children and adults."

Pediatric candidacy

"In children with a bilateral hearing loss indicated for a bone conduction solution, bilateral fitting should be strongly recommended as it potentially allow them to use all auditory cues to develop normal hearing."
Improved Patient Outcomes

The published clinical evidence clearly suggests that a two ear approach in bone conduction leads to improvements in the patient’s ability to localize sound and hear in noise. It also suggests that a bilateral solution can improve audibility and lead to greater patient satisfaction.

The RIGHT PATIENT will benefit from a BILATERAL SOLUTION.

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Choosing Candidates for Bilateral Baha® Systems

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Baha System Candidacy Review

- Conductive Hearing Loss
- Mixed Hearing Loss
- Single-Sided Deafness (SSD)
FDA Indications for Implantation

**Single-Sided Deafness**

- ≥ 5 years of age for surgical solution
- Normal Hearing in the contralateral ear
  - Defined as PTA Air Conduction thresholds equal to or better than 20 dB at 0.5, 1, 2 & 3 kHz
- Functions by transcranial routing of the signal

Baha® System Candidacy

![Graphs of Conductive Hearing Loss, Mixed Hearing Loss, Single-Sided Deafness (SSD)]

FDA Indications for Implantation

**Mixed & Conductive Hearing Loss**

- ≥ 5 years of age for surgical solution
- ≤ 65 dB HL Bone Conduction PTA
  - PTA of 0.5, 1, 2 & 3 kHz
- For bilateral fitting, symmetric bone conduction thresholds are defined as less than 10 dB difference on average (0.5, 1, 2 & 3 kHz) or less than 15 dB at individual frequencies
Bilateral Baha System Candidacy

Audiological indications
- Bilateral mixed or conductive hearing loss
- <15 dB difference on average (PTA) or
- <15 dB difference at individual frequencies

To achieve binaural hearing, bone conduction thresholds should be symmetrical.

Common otological causes (adults)
- Bilateral chronic otitis media, or other conditions leading to persistent air-bone gap

Common otological causes (pediatrics)
- Bilateral microtia/atresia
- Ear canal stenosis
- Treacher-Collins syndrome

Candidacy Evaluation

Pre-operative testing can be used to predict post-operative benefit

Steps for Evaluation
1. Fit the sound processor to the patient using a SoundArc or Softband and the Baha Fitting Software
2. Perform objective testing with and without Baha and compare
   - SSD: Spatially separated speech in noise
   - Conductive/Mixed: Speech or speech in noise
3. Evaluate subjective benefit
   - Informal assessment: “How does it sound?”
   - Formal assessment: Questionnaire (e.g., APHAB)
4. Counsel the patient
Bilateral Baha System Evaluation

Tips for demonstrating bilateral Baha Systems
• Fit on Softband or SoundArc ensuring it doesn't touch sound processor on contralateral side
• Consider programming both sound processors so that they can be linked for Active Balanced Directionality
• Balance the loudness for the second side to the initial side

Considerations for testing:
  > Compare results for unilateral condition to bilateral condition for speech in noise
  > Test with speech in front and noise behind for best results

Features in Baha® Sound Processors to Support Bilateral Fitting

Baha 5 Sound Processors
BCDrive™ Transducer Technology

- Less distortion
- More reliable
- Twice as efficient

Designed for clearer sound

Bilateral Features:
Active Balanced Directionality

Cochlear's Ardium Smart Platform enables smart connectivity through automatic ear-to-ear exchange between a bilateral pair of Baha 5 sound processors.

Scene Classifier II analyzes the listening environment and automatically selects the best signal processing strategy for both sound processors in any given situation.
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**Bilateral Features: Active Balanced Directionality**

- **Quiet environments**: The automatic ear-to-ear exchange optimizes each sound processor’s setting for the actual listening situation.
- **Speech from front in noise**: The automatic ear-to-ear exchange optimizes each sound processor’s setting for the actual listening situation.
- **Multiple speakers in noise**: The automatic ear-to-ear exchange optimizes each sound processor’s setting for the actual listening situation.
Scene Classifier II analyzes the listening environment and automatically selects the best signal processing strategy for both sound processors in any given situation.

**Bilateral Features: Active Balanced Directionality**

Scene Classifier II analyzes the listening environment and automatically selects the best signal processing strategy for both sound processors in any given situation.

- **Multiple speakers in noise**

- **Single speaker from beside/behind in noise**

Active Bilateral Directionality

The automatic ear-to-ear exchange optimizes each sound processor's setting for the actual listening situation.

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**Improved Speech Perception in Noise**

In the initial clinical testing, test subjects experienced improved speech perception when using an asymmetrical mode in a noisy and complex listening situation.

In a noisy and complex listening situation, test subjects improved speech perception by **23 percentage points** when using an asymmetrical directionality mode.

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Bilateral Features:
Bilateral Wireless Streaming

- Using the phone in noisy situations
  Direct with the iPhone® or Wireless Phone Clip

- Hearing over distance
  Wireless Mini Microphone or the mic in your iPhone

- Conversations in noisy environments
  Wireless Mini Microphone or the mic in your iPhone

Bilateral Features:
Baha Fitting Software Enhancements

- Active Bilateral Directionality can be enabled or disabled as desired
- Can fit a Baha 5 and Baha 5 Power as a bilateral pair
- Bilateral linking to allow program changes in both ears at once
- Copy audiogram feature for quick entry of bilateral audiograms in stand-alone software

Fitting Considerations for Bilateral Baha® Systems
Baha Fitting Software 5.4

1. Link available in myCochlear Clinic or from your Cochlear Representative

2. Enter your email and contact info into download website

3. Click on unique link that is sent to your email to begin installation

Bilateral Fitting Tips

- Connect to both sound processors to begin programming
- Link button will allow changes to be made to both processors at the same time
- Can “link” matching processors or a Baha 5 to a Baha 5 Power

Bilateral Fitting Tips

- If processors are linked, BC Select options will be applied to both sound processors
- Measure BC Direct separately for each ear (do not need to plug the opposite ear)
Bilateral Fitting Tips

- To make changes to each ear separately, click the "link" button to unlink the processors.
- Can use the arrows to copy the program settings from one side to the other.
- Control Sync allows adjustments on one side to affect the other (e.g., program change or volume control).

Bilateral Fitting Tips

After successfully saving the sound processor(s) settings, there will be a link to register the device in myCochlear Clinic.

Conclusions
Summary

• Two ears are better than one: the right patients will benefit from a bilateral bone conduction solution\textsuperscript{1}

• Baha 5 sound processors have unique features to support bilateral fittings when appropriate


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This guideline does not address all elements of standard practice and accepts that individual clinicians are responsible to:

• Advise recipients of their choice and ensure informed consent is obtained prior to delivering care

• Provide care within scope of practice, meet all legislative requirements and maintain standards of professional conduct

• Apply standard precautions, and additional precautions as necessary, when delivering care

• Document all care in accordance with mandatory and local requirements.

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Cochlear Baha 5 sound processors are compatible with iPhone, iPad and iPod touch. For compatibility information visit www.cochlear.com/compatibility

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