Adults with Single Sided Deafness
Understanding the Candidacy, Treatment Options, and How to Counsel Your Patients

Learning Goals:

1. Introduction
   - What is Single Sided Deafness (SSD)
   - Impact of hearing with only one ear

2. Treatment Approach
   - Comparing treatment options
   - Benefits of bone conduction in treatment

3. Identifying Candidates in Clinic
   - Candidate criteria
   - Testing and evaluation
   - Contraindications

4. Clinical Considerations & Counseling
   - Select the right system based on need
   - How to fit a Baha® System for SSD

5. Case Study Examples
Cochlear’s Mission

We help people hear and be heard.

We empower people to connect with others and live a full life.

We transform the way people understand and treat hearing loss.

We innovate and bring to market a range of implantable hearing solutions that deliver a lifetime of hearing outcomes.

What is Single Sided Deafness?
Overview | Identification | Causes
SINGLE-SIDED DEAFNESS (SSD)

Having a profound sensorineural hearing loss or a non-functional ear on one side with normal hearing on the other side is known as SSD.

Sounds from the deaf side are not heard and speech understanding in noise is likely more difficult in background noise.

Identifying SSD Candidacy

- **Poor Ear**
  - Non-functional hearing (i.e. un-aidable, profound hearing loss)
- **Good Ear**
  - PTA AC Threshold ≤ 20 dB @ 500Hz, 1kHz, 2kHz and 3kHz

**Key Factor:** The poor or "bad" ear has not or will not receive benefit when traditional acoustic amplification is applied.
Common Causes of SSD

SSD has a number of etiologies including:

- Sudden idiopathic deafness
- Ototoxic drugs
- Trauma
- Genetic factors
- Surgical intervention such as the removal of an acoustic neuroma
- Viral infections
- Measles
- Meniere’s disease

Impact of Hearing on Only One Side

Speech Perception | Social Interactions | Localization
Binaural Hearing vs Monaural Hearing

Speech Perception

Hard to understand speech and sounds, especially in noisy environments
Safety and Social Impact

Localization & Head Shadow Effect

Localization

- Normal localization is based on inter-aural time and level differences.
- When input from one ear is missing, the brain has difficulty telling where the sound originated.

Head Shadow Effect

- Most often effects high frequency sound coming from the poorer hearing side which is attenuated by the head as it travels to the better hearing ear.¹

Treatment Options for SSD
Comparing Treatment Options | Benefits of the Baha® System

Most Common Treatment Options for SSD

- Patient remains untreated*
- CROS Hearing Aids (HAs)
- Steroids
- Medical intervention - surgery
- Bone Conduction Devices - Baha System

*Patient or physician choice
How do you decide which treatment option is right for your patient with SSD?

- Simple solution?
- Power delivery to cochlea?
- Cost for patient?
- Cosmetic needs?
- Patient motivation/expectations?

How do you decide which treatment option is right for your patient with SSD?

- Resections including acoustic neuroma, bone conduction can be used as the primary treatment option.


*Findings from Market Research Firm, 2/2017-3/2017. Conducted interviews among 29 U.S.-based ENTs and Audiologists who have conducted or fitted more than two bone conduction implants over the past year and which were never brought up to the patient file. Results are based on experience and opinion of the interviewees as well as the combined patient file.

“In a recent survey of 29 hearing health professionals, bone conduction was the most successful treatment. Nearly 9 out of 10 times it served as the last or final line of treatment for patients with SSD.”

Comparing Treatment Options for SSD

Sudden SSD

Typical Treatment Paths

First Line

- Steroids
- CROS Hearing Aids

Bone Conduction

Second Line

Notable exception includes:

- Resections including acoustic neuroma, bone conduction can be used as the primary treatment option.
Cochlear™ Baha® System
Benefits for Patients with SSD

How a Baha® System Works

Baha Attract

1. A sound processor detects sound and transforms it to vibrations.
2. Sound Processor magnet transfers the vibrations from the sound processor through the skin.
3. The implant magnet received the vibration and transmits it to the implant.
4. The implant transfers sound vibrations to the cochlea.

Baha Connect

1. A sound processor detects sound and transforms it to vibrations.
2. DermaLock™ Abutment connects the sound processor to the implant.
3. Implant transfers sound vibrations directly to the cochlea.
Baha® System Candidacy Indications

- Conductive loss
- Mixed loss
- Single Sided Deafness

The Baha System for SSD

When using the Baha System in SSD, the signal is routed to the normal hearing ear via bone conduction across the skull, from the deaf side to the healthy cochlea on the hearing side.
Clinically Proven Patient Benefits

- Improved speech understanding in noisy environments.¹
- Helps to lift the head shadow effect¹⁴
- Reduces the psychosocial consequences associated with hearing impairment, ¹, ⁵⁻⁶
- Long term patient satisfaction and hearing benefits.⁷⁻⁸


Baha System vs. CROS Hearing Aids

Benefits of Baha System for SSD

- No hardware in or occlusion of the hearing ear
- No need to wear hearing devices on both ears
- Better hearing in noise¹
- Improved sound quality due to direct bone conduction²
- More useful in a variety of listening environments experienced in daily life³

¹ Findings from Market Research Firm, 2/2017-3/2017. Conducted interviews among 29 U.S.-based ENTs and Audiologists who have conducted or fitted more than two bone conduction implants over the past year. Each interviewee brought up to five patient files. Results are based on experience and opinions of the 29 interviewees as well as the combined 135 patient files.
Other Important Patient Benefits

- No extra hardware or occlusion in the hearing ear

- Demonstration of the Baha System
  - Ability to try before you decide

- Reimbursement
  - Often covered by insurance

- Wearable Technology
  - Customization and control of your hearing with,
    - Made for iPhone®
    - Baha Smart App
    - True Wireless™ Accessories

How to Identify Patients in the Clinic

Baha® System Evaluation | Candidate Criteria | Testing
Baha® System Evaluation for SSD

Step 1: Candidate Criteria

Step 2: Audiometric Testing

Step 3: Benefit Evaluation
- Hearing-in-noise testing
- Softband demonstration
- Subjective assessment

Step 4: Counsel the Candidate
- Fitting considerations
- Surgical consideration
- Which system and sound processor?

Step 5: Refer to an ENT specialist for a consultation or proceed with fit non-surgically

Step 1: Candidate Criteria

Determine patients who can benefit from a bone conduction system

<table>
<thead>
<tr>
<th>PATIENT CHARACTERISTICS</th>
<th>PATIENTS WITH CERTAIN EXISTING CONDITIONS</th>
<th>PATIENT ATTITUDE AND HISTORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Ages</td>
<td>Acoustic neuroma</td>
<td>Willing and able to care for and maintain the implant site</td>
</tr>
<tr>
<td></td>
<td>- Baha Attract and Connect System (Surgical Implant)</td>
<td>Are comfortable with and open to a surgical option</td>
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<tr>
<td></td>
<td>- Indicated for ages 5 and up</td>
<td>- Are scheduled for resection or similar surgery and placement of a bone conduction implant can be done concurrently</td>
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<tr>
<td></td>
<td>- Contraindicated for below the age of 5 years</td>
<td>Cannot wear hearing aids</td>
</tr>
<tr>
<td></td>
<td>- Baha Softband (Non-surgical)</td>
<td>Recently lost hearing</td>
</tr>
<tr>
<td></td>
<td>- Indicated for all ages</td>
<td>- The more recent the hearing loss, patients are more motivated to seek treatment than those who have lived with hearing loss longer term.</td>
</tr>
<tr>
<td>Common Causes</td>
<td>Acoustic neuroma</td>
<td>Do not want to wear a device in their good ear</td>
</tr>
<tr>
<td></td>
<td>- Sudden onset hearing loss</td>
<td>Have a realistic expectation of benefit</td>
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<td>- Idiopathic</td>
<td></td>
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<td></td>
<td>- Genetic factors</td>
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Step 2: Audiometric Testing

Includes unmasked and masked bone conduction

- Implant Ear (Poor Ear)
  - Severe to profound SNHL

- Contralateral (Good Ear)
  - Normal hearing
  - PTA AC Threshold ≤ 20 dB @ 500Hz, 1kHz, 2kHz and 3kHz

Note: In cases where there is a more significant hearing loss in the good ear, a bone conduction implant may not be the best solution.

Step 3: Clinical Benefit Evaluation

SSD Test Considerations

Hearing in Noise Testing

- QuickSin, HiNT or AZ Bio, are recommended to evaluate the benefit.
- Noise should come from the speaker facing the hearing ear, while speech comes from the speaker nearest the deaf ear.

- Test two situations to help determine individual benefit
  1. Unaided Condition
     - Test to establish the SNR or speech perception ability without treatment
  2. Aided Condition: Baha Softband
     - Test again to establish SNR or speech perception ability with the Baha System.

Difference in the SNR between the two situations has been shown to be a good predictor of individual benefit. The bigger the difference, the more benefit can be expected from the Baha System.


Patient speech-in-noise measurements can be used as an accurate predictor of the overall benefits of a bone conduction system for patients with SSD prior to implantation.14
Softband Demonstration

- Demonstrate the processor you intend to fit post surgery
- Cochlear expects demonstration outcomes using the Softband to be similar to Baha Attract outcomes.
- You should expect better sound transmission using Baha Connect due to the percutaneous implant.

Step 4: Counsel the Candidate
Determine which Baha System and Sound Processor is right for your patient

Fitting Considerations
- Practical points to consider
  - Hearing Expectations
  - Cosmetics
  - Hygiene
  - Dexterity
  - Sporting Activities/Head Gear
  - Radiation/ MRIs

Surgical Considerations
- Discuss surgical expectations
  - Typically a routine outpatient procedure
  - Performed under general anesthesia
  - Established treatment option +40 years

- Review the Guidebook, "What to Expect at Surgery/Activation"
Select the right power level*

- **Up to 45 dB SNHL**
- **Up to 55 dB SNHL**
- **Up to 65 dB SNHL**

* Baha System fittings for SSD require normal hearing in the good ear. Power level selection for patients with SSD will be based on the transcranial and soft tissue attenuation needs.

Determine Which System

**The Baha Connect System**
Transmits vibrations through a percutaneous abutment, which connects the sound processor to the implant.
- Direct sound transmission for maximum amplification
- High transcranial attenuation
- Indicated for ages 5 and up

**The Baha Attract System**
Transmits sound vibrations to the inner ear through a magnetic connection, between the sound processor and the transcutaneous implant under the skin.
- Provides a good aesthetic outcome with no need for daily care.
- Low transcranial attenuation
- Indicated for ages 5 and up

**The Baha Softband**
Uses a flexible headband to hold the sound processor, which transmit vibrations to the bone through the skin.
- Non-surgical option
- Low transcranial attenuation
- Indicated for children below the age of 5 years or older if recommended
Clinically proven hearing performance


Cochlear™ Baha® Attract System
Baha Attract with more power in the high frequencies*

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* Baha 5 SuperPower compared with BP110 Power at 6,000 Hz
** ODI90 measured on Artificial Mastoid IEC 60318-8
Cochlear™ Baha® Connect System
The strongest and most complete direct system

*OFL90 measured on skull simulator TU1000

SSD Fitting Scenarios

Baha Softband or Baha Attract
You might need a Power processor to overcome the transcranial attenuation + soft tissue attenuation

Pure SSD on a Connect System
Should be managed by Baha 5 but occasionally you will come across high transcranial attenuation and need more power in order for the recipient to perceive benefit.
Overview of Suggested Evaluation Process

CANDIDATE WITH:
- Single Sided Deafness
- BC thresholds within fitting range of a Baha Sound Processor

Finalize fitting of the sound processor

Perform BC Direct measurement with Baha Sound Processor on Softband

BC Direct thresholds in fitting range of Baha SP?

YES

Patient satisfied with benefit?

YES

Consider Baha Attract System

NO

Consider Baha Connect System

Switch to more powerful sound processor

Perform listening test with Baha Softband

Patient satisfied with benefit?

YES

Perform listening test with Baha Softband

Contraindications to the Implantation of Baha®

1. Poor bone quality or thickness (eg. Osteoporosis)
2. Poor hygiene (if considering Connect)
3. Unrealistic expectations (particularly with SSD)
4. Medical conditions affecting bone and skin growth
5. Age (contraindicated in children below the age of 5)
**Step 5:** Refer to an ENT specialist for a consultation or proceed with non-surgical fitting

**Next Steps:**

- If your SSD patient meets candidate criteria outlined in Steps 1-4, your next step is to refer your patient to an ENT specialist for a consultation.

- If your patient does not want to proceed with surgery, but does find value from the demonstration, consider fitting a Baha sound processor non-surgically and reevaluate over time.

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**SSD Case Studies**
Steve is a 38 year old man with sudden SSD of unknown etiology 3 years ago. He sings in a 1940’s tribute band and wears suits and horn-rimmed glasses everyday. He has been using a CROS aid, but he does not like wearing it with his glasses and he feels that his good ear is plugged, especially when he is trying to follow his bandmates.

Audiogram thresholds:

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<th>Frequency (Hz)</th>
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<th>L 500</th>
<th>L 1000</th>
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Following a successful trial in the clinic, Steve elected to move forward with a Baha Connect in the left ear. He successfully uses his Baha every day and reports it is so comfortable he sometimes forgets he is wearing it.

“I love using the Baha to talk on my iPhone – I didn’t expect that it would be so clear to use the phone.”

-Steve
Lia

- Lia is a 62 year old woman with a congenital hearing loss in the right ear. Recently, she has noticed some loss of hearing in her good ear and she is struggling to communicate at work.
- Lia is a florist who owns her own shop. She is very active and does not plan on retiring any time soon!
- Lia has not tried any previous treatment options for her hearing loss

Audiogram thresholds:

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<tr>
<th>Side</th>
<th>WRIS 250</th>
<th>500</th>
<th>750</th>
<th>1500</th>
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CASE 2
Lia - outcome

- Lia’s clinician discussed treatment options and she opted to trial the Baha first
- She loved the sound of a Baha 5 Power on the softband and elected to proceed with the Baha Connect
- Lia uses her Baha daily and especially likes using the Mini Mic 2+ at work with her colleague

| SNR loss (Quick SIN)* | Unaided (pre-op) | 12 dB | Baha on softband (trial) | 8 dB | Baha on abutment (post-op) | 7 dB |

*lower number is better

“I barely notice my Baha but my employees at work definitely notice if I don’t have it on!”
-Lia
Benefits of the Baha® System for SSD

- Improved sound quality due to direct bone conduction
- May report a sense of directionality due to increased sensation of sound on side with loss
- Improved speech understanding in noisy environments.
- Long term patient satisfaction and hearing benefits
- Try before you decide

**Compared to CROS Hearing Aids:**
- No need to wear hearing devices on both ears
- No occlusion of the hearing ear