Learner Objectives

1. Be able to describe the impact of unilateral hearing loss on the pediatric patient
2. Be able to describe the delays that are often associated with SSD/unilateral hearing loss
3. Be able to describe the different treatment options for the pediatric patient with unilateral hearing loss
4. Be able to explain how the technology of the Ponto can help a child with unilateral hearing loss
Outline

1. Introduction
2. Unilateral Hearing Loss
3. Newborn Hearing Screenings
4. Psychological Effects of Having Unilateral Hearing Loss
5. How Ponto has Helped
6. Technical Aspects of Ponto
7. Q & A
Unilateral Hearing Loss

Is one good ear, good enough?  Can my child hear well enough?  Can one ear hear as well as two ears?

Unilateral Hearing Loss

“The Left and Right Ears Are Not Created Equal”
By, Dr. Yvonne Siningr, PhD and Dr. Barbara Cone-Wesson, PhD
(Science, 10/10/2004)

“We always assumed our left and right ears worked exactly the same way. As a result, we tended to think it didn't matter which ear was impaired in a person. Now, we see that it may have profound implications for the individuals speech and language development."
Unilateral Hearing Loss

Loss of sound localization = safety concerns

Auditory Processing Disorder = trouble processing spoken language and filtering out noise

Information Processing Issues = learning disabilities

Unilateral Hearing Loss

“The Left and Right Ears Are Not Created Equal”
By, Dr. Yvonne Sininger, PhD and Dr. Barbara Cone-Wesson, PhD
(Science, 10/10/2004)

“We were intrigued to discover that the clicks triggered more amplification in the baby’s right ear, while the tones induced more amplification in the baby’s left ear….finding that the clicks resembled the rhythm of speech, which produced a greater response in the right ear….showing that sounds coming from the right side were more important for intonation.”
Unilateral Hearing Loss

“Unilateral Hearing Loss – How Serious Is it?”
By, Dr. Jane Madell, PhD., Editor
(Hearing and Kids, 3/2012)

“Brain research has demonstrated that language is a left brain activity and the majority of fibers from the right ear go to the left side of the brain so, if a child is going to have a hearing loss in one ear, it would be better if it were the left one. (If only we could control this.)”

Unilateral Hearing Loss

“Unilateral Hearing Loss in Children: Challenges and Opportunities”
By, Oyler, R. and McKay, S.
(The ASHA Leader, 1/22/2008)

“Studies show that even before they enter school, children with UHL are at risk for speech and language delays. Although the average age for first words was found to be within normal limits (12.7 months), the average age for the first two-word utterances was found to be significantly delayed in children with UHL (Kiese-Himmel, 2002).”
Studies have shown that unilateral hearing loss will require 30% of students to repeat a grade level by 3rd grade."


“Children with UHL were approximately 10 times more likely to fail a grade than their normal hearing peers.”


Good review article: Minimal Hearing Loss: From a Failure-Based Approach to Evidence-Based Practice (2016). By Winiger, Alexander, & Diefendorf (AJA, Vol 25).

“With 30 dB hearing loss, can miss 25-40% of classroom discussion; with 35-40 dB hearing loss can miss as much as 50% (Anderson & Matkin, 1998)”

Newborn Hearing Screenings

“Lyla, was born without an ear canal in her left ear. Even though Lyla referred on the new born hearing screening, the staff continued to do the screening until the baby passed….up to three times until Lyla finally passed. While we were not sent to an audiologist or ENT, we eventually met with a pediatrician a week later. The pediatrician not only told us that Lyla may have hearing loss in her left ear, but he was surprised that no one at the hospital referred our family to see an ENT or audiologist for having a closed ear canal alone.

- Nakita, Colorado, (6/2016)

Newborn Hearing Screenings

“Noah was born with Microtia and Atresia of his right ear and he passed his newborn hearing test too. Later as a toddler, I realized he was having hearing and speech problems. We didn't find out he had atresia till he was almost five. Because of that newborn hearing screen I felt that not only did it give a false sense of hope, but it delayed in getting the help he needed.”

- Amanda, Texas (1/2013)
Newborn Hearing Screenings

“Joshua referred on his newborn hearing screening. It was explained to me that he had a unilateral hearing loss, but he can still hear well. Josh is now five years old and I have noticed over the years that he doesn’t mimic songs very well and is saying “what” a lot. Even after having his hearing checked over the years, finally for the first time, I was told about a hearing device that could help him. If I hadn’t been told that he could still hear well, I wouldn’t have waited five years to get him the help he needed. No one ever said anything to us about getting him a hearing device.

- Elisabeth, Michigan, (3/2016)

Newborn Hearing Screenings and BAHS

“My daughter, Clark, is now 21 months old and has Microtia and Atresia of her right ear. She does not have a BAHA yet, but we are working on it. It is not "standard practice" with her group of audiologists to treat unilateral loss with a BAHA. We have been told that there is not enough research to support this, but I disagree. We have an appointment with her ENT on Wednesday, so we hope to get closer.

- Janae, North Carolina (5/2013)
Newborn Hearing Screenings and BAHS

“My daughter, Eden, was born with unilateral hearing loss due to Microtia/Atresia in September (2010). **At our first ENT visit ‘the best’ doctor in Omaha wasn’t going to mention a BAHA until I brought it up.** **Eden is being fitted for her first BAHA in 2 weeks.**”

- Jay, Nebraska (9/2010)

Newborn Hearing Screenings and BAHS

“Once I found out about a BAHA, I called my hearing center and got a loaner within a month. **The Audiologists say the earlier the better and nobody ever even mentioned a hearing device for babies.**”

- Casey, Texas (11/2012)
Newborn Hearing Screenings and BAHS

“Supplement to the JCIH 2007 Positions Statement: Principles and Guidelines for Early Intervention After Confirmation that a child is Deaf or Hard of Hearing” (Pediatrics, Vol. 131, No. 4, 4/2013, pg.9)

“Research indicates that there are sensitive periods for the development of auditory skills and spoken language, specifically, the first 5 years of a child's life are critical for development in these areas. To optimize this short time period of a child's life, families and infants/children who are D/HH require the highest level of provider skills at the very beginning of the child's life.”

Newborn Hearing Screenings and BAHS

Bone Anchored Hearing Systems and the Softband Head Band can be used on children under 5 years of age
Newborn Hearing Screenings and BAHS

Bone Anchored Hearing Devices and Systems
Softband Head Band

- Standard or personal preference?
- Recommended age?
- Regional?

Psychological Affects of Unilateral Hearing Loss

1. Acting out
2. Fatigue
3. Struggles with learning disabilities and delays
4. Social shyness
5. Denial of hearing loss
6. Fear
How Ponto Has Helped

Because sound matters

1. Improved hearing
2. Better response
3. Safer
4. More confident
5. Back to par with peers
6. Makes hearing fun again

Because sound matters
**FM Systems and BAHS**

- Helps with clarity of sound
- Helps in the classroom setting
- Helps allow children to meet and exceed expectations in the classroom

*Pictured: Oticon Medical Ponto processors w/Amigo FM System*  
https://www.youtube.com/watch?v=1l37lzLigQU

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**Helpful Tips and Information About Hearing Loss**

1. IFSP, IEP, and 504 Plans
2. Early Intervention programs and service providers
3. Support groups
Helpful Tips and Information About Hearing Loss

Try not to get frustrated and don't give up!

1. Make it fun
2. Better when in upright position
3. Take the stress out (what's easiest for you works).
4. Stay in control

Helpful Tips for Wearing a BAHA
Helpful Tools for Understanding Hearing Loss

The critical years of development (birth to 3)

Speech banana chart sourced from the AAA, www.Audiology.org

Helpful Tools for Understanding Hearing Loss

Ear Community

Because sound matters
Helpful References and Resources

“Five Things You May Not Know About Your Hearing,” by, Debbie Clason, (Healthy Hearing, 10/20/2015).

“Ponto and the School Age Child – A Parent’s Perspective,” interview with Melissa Tumblin, (AudiologyOnline and Oticon Medical/7/25/2016).


“Unilateral Hearing Loss – How Serious Is it?” by, Dr. Jane Madell, PhD, CCC-A/SLP, LSLS Cert AVT, Editor (Hearing and Kids, 3/2012).

“Understanding Single Sided Deafness: Evaluation and Treatment for Professionals,” by, Dr. George Cire, Ph.D, AuD, (Online HOPE Series 8/2012).


“The Left and Right Ears Are Not Created Equal,” by, Dr. Yvonne Sininger, Ph.D (Science, 10/10/2004). See also NY Times Article “The Right Ear is From Mars,” by Anahad O’Connor, 9/14/2004).

Helpful References and Resources

“Children With Unilateral Hearing Loss Are More Likely To Struggle In School,” by, Dr. Judith E.C. Lieu, MD (ENT), Washington University School of Medicine, 7/20/2013.

The Ear Community Organization, www.EarCommunity.org, see all sub links under the Hearing Loss menu tab hearing loss sound simulations.


Hearing Aid and FM System simulation - https://www.youtube.com/watch?v=1l37lzLIgQU
Helpful References and Resources

"Itinerant Teachers of the Deaf and Hard of Hearing."

Here’s a great article on understanding audiograms, the impact of the speech banana, and sound simulation examples.

For more information about hearing loss and support, contact any of the following organizations and medical professionals:
- HLAA (Hearing Loss Association of America), www.HearingLoss.org
- ASHA (American Speech-Language-Hearing Association), www.ASHA.org
- EHDI (Early Hearing Detection and Intervention), www.EHDI.org
- Ear Community Organization, www.EarCommunity.org
- Contact any school for the deaf in your state.

- Birth to Three Organization, www.birthtothree.org or any Early Intervention program provider in your state where you can find help from speech therapy, physical therapy, and occupational therapy professionals, ASL interpreters, and information on IFSP, IEP, and 504 plans.

"Information Processing Issues: What You Need to Know," by, Amanda Morin, reviewed by Ellen Braaten, Ph.D.

- Always visit with your local ENT and audiologist to learn about hearing loss, hearing device options, surgical options, how to monitor hearing and more!

Education is Key

While it is important to be aware of every child’s hearing loss, it is even more important to recognize that every child can be affected differently by their hearing loss. Every child deserves to get the help he/she needs.

Together, we can help make things easier for the next family who has a child with unilateral hearing loss/single sided deafness.

Thank you!
Considerations for Unilateral Hearing Loss

Mary Humitz, AuD
Clinical Specialist

Financial Disclosure

Financial: I am a paid employee of Oticon Medical, LLC

Course content describes the Oticon Medical Ponto Bone Anchored System
Children Need Access to Speech to Develop Their Listening, Language and Learning Skills

Educational Considerations
Because
sound matters
Classroom Listening Conditions

- Varying classroom noise results in an equally broad range of SNRs.

- Many studies have shown evidence of a correlation between age and performance in adverse listening conditions. (Bradley & Sato, 2008, Klatte et al., 2010, Neuman et al., 2010)

FM Speech recognition scores as a function of SNR for 4 different age groups at reverberation condition of 0.6 s. Younger age groups are more affected by poorer SNRs. Modified with permission from Neuman et al. 2010.

Normal Hearing in Both Ears is Not Always Enough

- To cope in complex listening environments children must handle multiple acoustic stimuli simultaneously

(Moore, 2012)
### Factors That Compromise Listening Under Complex Acoustic Conditions

<table>
<thead>
<tr>
<th>Factor</th>
<th>Challenge</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain immaturity</td>
<td>The late development of pre-frontal connections makes it challenging for children to employ attention control to relevant sound sources in distracting environments.</td>
<td>Hwang et al. 2010</td>
</tr>
<tr>
<td>Auditory inexperience</td>
<td>Children need a rich “auditory diet” to practice perceiving and processing sound to become good listeners.</td>
<td>Flexer 2011</td>
</tr>
<tr>
<td>Language unfamiliarity</td>
<td>Non-native listeners and second/third-language learners are compromised with respect to phoneme recognition and show poorer performance of speech understanding in noise.</td>
<td>Tabri et al. 2011</td>
</tr>
</tbody>
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### Factors That Compromise Listening Under Complex Acoustic Conditions

<table>
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<tbody>
<tr>
<td>Unilateral or minimal hearing loss</td>
<td>Audibility and binaural hearing is a prerequisite for optimal spatial separation of competing sound sources in complex listening situations.</td>
<td>Rothpletz et al. 2012</td>
</tr>
<tr>
<td>Cognitive or perceptual load</td>
<td>Considerable listening effort is required when listening at SNRs that are typical of the school classroom. As proven by a dual-task paradigm, the availability of cognitive resources impacts a child’s ability to perform in noise.</td>
<td>Howard et al. 2010</td>
</tr>
</tbody>
</table>
Pediatric Considerations

- "Children are learning language, and do not have the capacity to “fill in the blanks” for sounds that are not audible”

- "Children spend most of their time listening to the speech of other children and women, which has greater high frequency content than that of males”

- "Children who use hearing aids must develop the ability to use information acquired while hearing amplified, processed sound”

- "Children have more demanding listening environments than adults for understanding speech… Enhancement of audibility is required either through increased level, increased SNR, or improvement of the listening environment”

AAA Pediatric Amplification Guidelines, 2013
Ponto Plus Processors

- A powerful FAMILY of wireless bone anchored sound processors!

- More High Frequency Gain & Extended Bandwidth provides access to the full pitch range of speech, especially the important high frequencies
  - Speech perception
  - Sound quality
  - Understanding speech in noise

- Speech Guard protects the subtle details of speech

- Inium Wireless Platform with Feedback Management system
  - Developed for power aids and bone anchored device

Bone Conduction Direct Drive vs Skin Drive Systems

- There are two types of bone conduction devices:
  - Direct Drive devices send vibrations via direct route to bone (percutaneous)
  - Skin Drive devices send vibrations through the skin to bone
    - Transcutaneous
    - Softband and magnet solutions provide similar performance

Sounds are Attenuated in Skin Drive Solutions

- Physical facts with skin drive solutions:
  - There is 10-20 dB sound attenuation in mid to high frequency region\(^2\)
  - These devices have lower perceived output in the mid to high frequency region
  - Similar to using a softband or test headband

Consequence of Skin Attenuation on Speech Phonemes

*Verstraeten et al (2008) Comparison of the audiologic results obtained with the bone-anchored hearing aid attached to the headband, the testband and to the ‘snap’ abutment. Otology & Neurotology 30: 70-75*
Other AO Ponto Courses for your Reference

- The Newest Generation Ponto System

- Ponto, The Bone Anchored Hearing System: Providing Significantly Reduced Listening Effort As Compared To Skin Drive Solutions

- Minimally Invasive Ponto Surgery – A New Perspective on Bone Anchored Surgery

- Parents’ Perspective: The Decision Making Process for Bone Anchored Hearing Systems for Children

- Overcoming Distance and Noise: Strategies for Successfully Utilizing FM with the Ponto System

- Wireless Connectivity in our Daily Lives: Enhancing the Ponto Plus Experience
Contact Information

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Thank you!