Unilateral Hearing Loss:
Advocating for Children through Early Intervention Services and in the Classroom

Presented by:
Melissa Tumblin and Mary Humitz, AuD

Learner Outcomes
After this course, participants will be able to:
- Identify the challenges that a unilateral conductive hearing loss can cause in children.
- Explain the value of classroom advocacy and early intervention services for both families and their children during the critical years of development and beyond.
- Explain the benefits of treating unilateral hearing losses using a bone conduction device.
Objectives:

- Understanding Unilateral Hearing Loss (UHL)
  - Being educated as to why one good ear is not good enough
- How Early Intervention services can help
- Why advocating in the school classroom is paramount
- Why being educated and informed can make a difference for your child
  - A child should always be given the opportunity to try a hearing device. Especially, during the critical years of development

Unilateral Hearing Loss: Advocating for children through Early Intervention services and in the classroom
Microtia and Atresia in Review

- Microtia is a congenital deformity affecting the outer ear (pinna) where the ear does not fully develop during the first trimester of pregnancy.
- Aural Atresia is the absence or closure of the external auditory ear canal.

Microtia and Atresia in Review

Grade I  Grade II  Grade III  Grade IV
Microtia and Atresia in Review

Quick Facts:

- Microtia and Atresia is a congenital deformity. (not caused by the parent during pregnancy (not environmental)).
- Microtia and Atresia is more common in males and affects the right ear more often (even though it can be bilateral).
- Microtia and Atresia occur more often in Latino/Hispanic, Native Americans and Asian ethnicities. (Most common in Ecuadorian and least common in African American).
- 1 out of every 6,000 births.
  - (Approximately 500 babies are born in the US each year. ~33,000 in the US and over 750,000 in the world).
- There are reconstructive options for Microtia and Atresia, including prosthetic ears.

Our Story
Why Early Intervention Services are Important

- Confusion, overwhelmed, and not being educated immediately

Understanding Unilateral Hearing Loss

- Why is this important?
  - One good ear is not good enough!
    - Ability to localize sound is gone (whispers, sneaking up, etc.).
  - Being educated about hearing loss & newborn hearing screening.
    - Critical years of development (birth to 3 or age 5).
  - Recognizing speech delays and auditory processing delays.
    - Number of words spoken at age.
  - Each one of us manages our hearing loss differently.
  - UHL is an invisible disability.
Understanding Unilateral Hearing Loss

Degree of hearing loss
0-25dB Normal Hearing Limits
26-40dB Mild Hearing Loss
41-55dB Moderate Hearing Loss
56-70dB Moderately Severe Hearing Loss
71-90dB Severe Hearing Loss
> 91dB is Profound Hearing Loss

Finding our way with Ponto
Finding our way with Ponto

- IFSP, IEP or 504 Plan
- Therapies (speech), ASL sign, and visual phonics in the classroom
- IDEA laws for hearing impairment
- Grants through EI provider programs and services
- Community events and support groups for individuals and their families in the same situation
Take-A-Ways

- One good ear is not good enough!
- 1 Ear can never hear as well as 2 ears can.
  - Challenges and delays, safety issues, misunderstandings (acting out), fatigue, the inability to localize sound, and missing out on life’s sounds.
- Advocating for parents and their children is priceless.
  - Not everyone is informed about services, products, and help.
- Guidance and education is key! It is always okay to ask.
  - Parents should know they can always ask for help. Educators and therapists are here to help our children.
- Sharing what we already know and learning from each other helps us gain more knowledge, allowing us to work together doing even more good.
- It is always okay to seek multiple medical opinions.

Helpful Resources

- Microtia and Atresia Support:
  - The Ear Community Organization, www.EarCommunity.org
  - The Microtia and Atresia Support Group on Facebook
- State Early Intervention service providers:
  - School districts, schools for the deaf, universities, and children’s hospital networks
- AudiologyOnline/continued: www.AudiologyOnline.com and www.continued.com
- The EAA (Educational Audiology Association): www.edaud.org/
- ASHA (America Speech and Hearing Association): www.ASHA.org
- NCHAM (National Center for Hearing Assessment and Management): www.infanthearing.org
Helpful Resources

- Vanderbilt University’s Mama Lere Hearing School at Vanderbilt: https://ww2.mc.vanderbilt.edu/HearingHearingAids/
- Gallaudet University: http://www.gallaudet.edu/about
- California Ear Institute: http://www.californiaearinstitute.com/
- House Ear Institute: https://hei.org/
- Stanford Ear Institute: https://med.stanford.edu/ohns/healthcare/earinstitute.html
- EHDI (Early Hearing Detection and Intervention): www.EHDIMeeting.org
- Marion Downs: www.MarionDowns.com

Oticon Medical: www.oticonmedical.com/us

Helpful Articles

Thank you for helping all of our kids thrive so they can be super everyday!

Unilateral Hearing Loss:
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Presented by:
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Objectives:

- What is Bone Conduction?
- Candidacy
- What is BrainHearing™?
- Sound Matters

Financial Disclosure

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

Course content describes the Oticon Medical Ponto Bone Anchored System
What is a Bone Conduction System?

- Sounds are converted to vibrations, which the skull transmits directly to the inner ears.

Candidacy
Candidates for a Bone Anchored Solution

- Atresia/Microtia
- Chronic otitis media
- Cholesteatoma
- Middle ear dysfunction/disease
- External otitis
- Syndromes (e.g. Treacher Collins, Goldenhar, CHARGE…)

Children with Conductive and Mixed Hearing Loss

Unilateral or bilateral typical diagnosis:
- Atresia/Microtia
- Chronic otitis media
- Cholesteatoma
- Middle ear dysfunction/disease
- External otitis
- Syndromes (e.g. Treacher Collins, Goldenhar, CHARGE…)
Conductive and Mixed Hearing Loss

Bone-Anchored Device Compared with Traditional Hearing Aids
Direct Bone Conduction Stimulation

Softband: Comfortable & Safe to wear
Single-Sided Deafness (SSD) (Unilateral Sensorineural HL)

Deaf cochlea  

Functioning cochlea

Other Patient Indications for Bone Conduction – Fluctuating Hearing Loss

Softband

- Non surgical option with children who should eventually grow out of middle ear problems that create a fluctuating conductive hearing loss

Benefits:

- No risk of over amplification if wearing on days when hearing is normal
- Ear canal remains open – small canal, wax, drainage does not affect function

- Hearing is constant. The amount of fluctuation is all related to the middle ear and Ponto on softband overcomes any middle ear issue
BrainHearing™

Because the Brain is the Most Important Part of Hearing

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 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
Hearing Loss in Only One Ear, “What’s the big deal?”

Listening & Learning Challenges

- Any time listening is not easy it will be harder for a child with unilateral hearing loss to pick up new words.
- Hearing from a distance is a challenge.
- Children with unilateral hearing loss may be **10 times** more likely to fail a grade in school or need special help to keep up in school.
- **1/3 to 1/2** of children with hearing loss who have not received help to hear better have problems learning in school.
- Also, because most rules of social interaction are learned via subtle auditory cues and visual cues, rather than direct teaching, it isn’t a surprise that about **1/5** of these children will develop behavioral or social issues.


What is BrainHearing?

The most important part of hearing

*BrainHearing™* is about a fundamental understanding of how hearing works – and how the brain makes sense of sound.
What is an Implant System?

Direct bone conduction through an Abutment and Implant

Ponto is an auditory osseointegrated bone conduction implant system

What is an Implant System?

Direct bone conduction through an Abutment and a Ponto Processor

Ponto Implant System
For children under the age of 5, or for those who do not have an implant and abutment, the Bone Anchored Hearing System can be used with a headband:

Sound Matters
Ponto 3 – Powerful sound quality

Industry Widest Frequency Bandwidth

- Frequency bandwidth is needed for the full spectrum of sound and particularly important for speech understanding.

*Linear comparison of equivalent bone anchored sound processors. The perceptual performance has not been evaluated.*
The Importance of Extended Bandwidth

- Task: Learn 5 new words
  - Sothnud
  - Doztul
  - Fosnush
  - Stomun
  - Homtul

- 2 groups of children,
  - one listened to limited bandwidth -> 4.6kHz
  - the other listened to extended bandwidth -> 9 kHz

- Research question:
  How many trials do they need to be able to pair the word and picture correct?


Results:
Children learn new words 3 times quicker with extended bandwidth compared to the children who listen to limited bandwidth.


*The study included both normal hearing and hearing impaired children who were exposed to limited and extended bandwidth. No conclusion can be drawn from this study with regards to Ponto 3.
The Importance of Direct Sound Transmission

- Does direct sound transmission affect cognitive tasks, and listening effort?
- How do we measure the affects of DST?
  - Determine ecological listening situations
  - Compare listening effort between groups

**SWIR test**
Sentence – final Word Identification and Recall

Cognitive Outcome Measure at Ecological Signal-to-Noise Ratios

Method, SWIR Test

... at an SNR which allows 95-100% intelligibility (typically +5 ... +15 dB)

Task: listen to speech in noise

1. They all wear sunglasses


Method, SWIR Test

Task: repeat last word

1. They all wear sunglasses

Method, SWIR Test

Task: repeat last word (of 7 sentences)¹
1. They all wear **sunglasses**²
2. He is still in **bed**
3. The student writes a long **report**
4. The whole town came to the **wedding**
5. His daughter is going to **college**
6. Yesterday, the film **premiered**
7. The factory gate was not **closed**

Task: recall final words

"Erm … closed … premier … bed … sunglasses … umm … hm!"

² Test conditions used sentences in Danish which have been translated here into English

Method¹

Ponto Plus Power optimally fitted on abutment and softband

Speaker Setup

Recall is significantly better for abutment compared to softband fitting.

Results¹

Overall recall (n=16)

<table>
<thead>
<tr>
<th>% of words correctly recalled</th>
<th>Direct Sound Transmission solution</th>
<th>Skin Transmission solution</th>
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<tbody>
<tr>
<td>52</td>
<td>![Diagram of Direct Sound Transmission solution]</td>
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<tr>
<td>46</td>
<td>![Diagram of Direct Sound Transmission solution]</td>
<td>![Diagram of Skin Transmission solution]</td>
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The Importance of Extended Bandwidth and Direct Sound Transmission

Skin transmission

Direct Sound Transmission
Ponto 3 Family of Processors & Accessories

Visit Oticonmedical.com

What is bone conduction hearing?

This method of hearing uses the skull to conduct vibrations. Unlike the Ponto Transcranial implant, which allows for bone conduction hearing and built to overcome the many challenges of hearing loss.
Recap of Considerations for Bone Anchored Technology

- What is bone conduction
- Candidacy
- BrainHearing™
- Sound Matters

References/Resources

- Link to Ponto Sound Quality https://youtu.be/X_rL8dKGP-o