Hearing preservation in children using various electrode arrays

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Rationale for CI hearing preservation

- Marker for health of cochlea, minimization of trauma, optimize outcomes
- Improved sound quality with difficult situations and music
- Don’t want to lose what they still have
- Opportunity to take advantage of future technologies
Background

- Described surgical techniques for hearing preservation vary, but meta-analyses indicate surgical approach is not an important variable in hearing preservation rates.

- Current evidence in adults suggests that even when hearing is preserved postoperatively, in a subset of patients it is not preserved over time (excitotoxic environment, delayed fibrosis?)
Case Presentations

- 3 recent pediatric cases from our center, each implanted with different devices/arrays
- All had preserved residual acoustic hearing
- All excellent performers with CI
- Each of these patients raises important considerations in our approach to maximizing benefits of hearing preservation
Case 1

- 12 yo F with hearing loss from birth, aided from 6 mo.

- Bilateral residual low frequency but sloping severe loss in high frequencies. 18% speech discrimination on left preop

- Attempted hearing preservation with slim-straight 422 cochlear implant inserted to 20 mm on left

- Perioperative steroids

- 1 yr CI only: CNC-W  70%
  HINT-N  98%
Case 1: 12yo F Left 422 slim-straight to 20 mm

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<thead>
<tr>
<th>Frequency (Hz)</th>
<th>Preop (dB)</th>
<th>Stim (dB)</th>
<th>3 mo (dB)</th>
<th>1 year (dB)</th>
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<td>125</td>
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<td>750</td>
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- Hearing preserved surgically
- At stim, disabled apical E 22, 21 with adjustments to map to facilitate EAS
- Hearing dropped at 3 mo., improvement with steroids
- Re-programmed (N5 device) and prefers to use standard FAT, very pleased with CI
Case 2

- 5 y F with EVA/Mondini progressive bilateral SNHL
- Underwent right CI with Nucleus Freedom CA N5
- 1 yr CI only: PBK-W 98%
  HINT-N 94%
Case 2:  
5yo F Right Nucleus Freedom

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<th>Preop (dB)</th>
<th>3 mo (dB)</th>
<th>1 year (dB)</th>
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Case 3

- 2 yo M underwent right CI at age of 2 with 1J AB device
- At age 8, underwent bilateral sequential implantation with AB MSE for progressive loss of hearing on left
- 1 year post-sequential CI left ear only and (bilateral CI):
  - PBK-W: 80%(96%)
  - HINT-N: 96%(92%)
### Case 3:
8yo M sequential left AB MSE

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<tr>
<th>Frequency (Hz)</th>
<th>At CI1 (dB)*</th>
<th>Preop CI2 (dB)</th>
<th>3 mo CI2 (dB)</th>
<th>1 yr CI2 (dB)</th>
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*Stable hearing on non-implanted left ear from age 2-5
Many electrode arrays have potential to preserve residual hearing

Case 1: When aidable thresholds are preserved, an integrated device may be needed to use acoustic hearing

Case 2: Depending on degree of residual hearing preoperatively, it may be “completely” preserved (<10 dB loss) but not necessarily reside in usable level

Case 3: Progressive nature of loss may be more formidable challenge to preservation than saving hearing surgically
Utilizing residual acoustic hearing

- To take advantage of this residual acoustic hearing requires an integrated hearing aid for acoustic component onto external processor

- Should presence of residual low-frequency hearing alter device/length of array chosen given likelihood of progression?
Role and rationale for residual hearing remains to be defined

Kids are not simply “little adults.” Hearing loss patterns in children often progressive
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Thank you