Children with Single-Sided Deafness

- May present with difficulties including
  - Decreased hearing in background noise
  - Poor localization ability
  - Speech and language deficits
  - Decreased educational performance
  - Increased incidence of behavioral issues in the classroom
Current Treatment Options

- Traditional amplification
- CROS (Contralateral Routing of Signal) systems
- Osseo integrated bone anchored devices
- FM systems in the classroom
- No treatment

These options can not provide hearing to the affected ear or binaural hearing
Results for SSD Adults with Cochlear Implants

- Improved speech perception in background noise
- Improved localization ability
- Reduced tinnitus
- All 12 patients are full-time users of their cochlear implants
Objective

- To determine the effects of cochlear implantation in pediatric patients presenting with single-sided deafness
- To identify factors which may affect performance
### Subjects

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Etiology</strong></td>
<td>EVA, progressive, Pendred syndrome</td>
<td>Congenital hereditary</td>
<td>Congenital unknown</td>
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<tr>
<td><strong>Length of Deafness</strong></td>
<td>Unknown; Dx at age 7</td>
<td>6yr, 2mo</td>
<td>2yr</td>
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<tr>
<td><strong>Hearing Device pre-CI</strong></td>
<td>HA; BAHA</td>
<td>HA; BAHA</td>
<td>HA; CROS</td>
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<tr>
<td><strong>PTA (Better/normal hearing ear)</strong></td>
<td>12dBHL</td>
<td>13dBHL</td>
<td>13dBHL</td>
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<tr>
<td><strong>PTA (Ear to be implanted)</strong></td>
<td>110dBHL</td>
<td>96dBHL</td>
<td>115dBHL</td>
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<tr>
<td><strong>Age at Implant</strong></td>
<td>9yr, 6mo</td>
<td>6yr, 2mo</td>
<td>2yr</td>
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<tr>
<td><strong>Device</strong></td>
<td>Nucleus CI512</td>
<td>Advanced Bionics HiRes 90K Advantage</td>
<td>Nucleus Freedom CA</td>
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<td><strong>Length of CI use</strong></td>
<td>3yr, 2mo</td>
<td>2yr</td>
<td>3mo</td>
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<tr>
<td><strong>Educational Setting</strong></td>
<td>Mainstream</td>
<td>Mainstream</td>
<td>Early Intervention; Daycare</td>
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</table>
Methods

- Standard, age-appropriate audiometric procedures for air/bone conduction thresholds using insert phones
- Speech perception measures performed in sound field at 60dBSPL using plug and muff
- Monosyllabic words – LNT, PB-K, CNC
- Sentences in noise – Common Phrases, HINT-C, BKB-SIN
Results

- All subjects have fully inserted electrode arrays
- S1 and S3: consistent use of their speech processor
- S2 wears the speech processor only in school
S1 Results
CNC Words

Pre-Op 1-yr 3-yrs

CI Ear BH Ear Bilateral
S1 Results
BKB-SIN (CI Ear)

Pre-op vs 1-yr

- SF/NF
- SF/NL (towards CI)
- SF/NR (towards BE)
S1 Results
BKB-SIN (Bilateral)

Due to onset of HL in better ear, BKB-SIN scores declined.
S2 Results: 3-Month Data
Monosyllabic Words and Sentences

PB-K Words
HINT-C (Q)
HINT-C (N)

Pre-op
CI Ear
NH Ear
Bilateral
Summary & Conclusions

- Overall, subjects demonstrated
  - Open-set speech perception in the implanted ear
  - Bilateral improvement in background noise

- Subjectively, parents and schools report
  - Increased attention
  - Improvement in grades
  - No longer asking “what” repeatedly
  - No longer fearful of social situations (e.g., school cafeteria, outings with friends)

- Cochlear Implants: Viable treatment option for children with SSD
Issues

- Counseling
  - Benefits of binaural hearing for home, school and social settings
  - Compliance with device usage
- When to implant
- Difficult parental decision
- Cost
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