Bilateral Cochlear Implantation for Patients with Enlarged Vestibular Aqueducts:

Evaluating Factors that Influence Outcomes

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Disclosures

(None)
Observation: Many non-users of the second-implanted ear had a diagnosis of EVA.

What we wanted to know:

• Is this different than patients with other diagnoses?
  – If so, what makes kids with EVA more prone to non-use?

• What can we change about our current practices to maximize outcomes for BOTH EARS for patients with EVA?
Bilaterally-implanted children with EVA: What can we learn from the literature?

• Most EVA studies include only unilaterally-implanted children (Ko et al., 2013; Chen et al., 2011).

• Studies that do include bilaterally-implanted children:
  – Measure success by soundfield PTA (Lee et al., 2014: n=4)
  – Comment that they could not investigate aspects related to bilateral implantation due to a small sample size (Pritchett et al., 2015: n=9)
  – Could not compare ears within subjects (Manzoor et al., 2016, n=18)
Subjects

20 patients with a diagnosis of EVA who were bilaterally implanted:

- 15 sequential, 5 simultaneous
- 15 females, 5 males
- Age at first implantation: 12 months to 19 years (mean=7.4 years)
- All subjects are spoken-English communicators, though some also sign
- Patients with isolated EVA as well as EVA with other bony structure abnormalities are included
- All 3 CI manufacturers represented
Percentage of patients who are NON-USERs of their second-implanted ear

<table>
<thead>
<tr>
<th></th>
<th>Sequential</th>
<th>Simultaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-EVA</td>
<td>5% (12/248)</td>
<td>0% (0/31)</td>
</tr>
<tr>
<td>EVA</td>
<td>40%** (6/15)</td>
<td>0% (0/5)</td>
</tr>
</tbody>
</table>

** Indicates statistically significant difference (p < 0.001)
Reasons for non-use of second CI

2 patients with EVA and 4 patients with other diagnoses are “trying again”.

EVA (n=6)
Non-EVA (n=12)
## Comparisons of factors for sequentially implanted patients

<table>
<thead>
<tr>
<th>Factor (months)</th>
<th>Users (n=9)</th>
<th>Non-users (n=6)</th>
<th>Difference (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of deafness prior to 1\textsuperscript{st} CI</td>
<td>14 (±17)</td>
<td>16 (±10)</td>
<td>2</td>
</tr>
<tr>
<td>Duration of deafness prior to 2\textsuperscript{nd} CI</td>
<td>59 (±42)</td>
<td>91 (±46)</td>
<td>32</td>
</tr>
<tr>
<td>Duration between 1\textsuperscript{st} and 2\textsuperscript{nd} CI</td>
<td>35 (±21)</td>
<td>78 (±42)</td>
<td>43*</td>
</tr>
</tbody>
</table>

* Indicates statistically significant difference (p = 0.05)
<table>
<thead>
<tr>
<th>Factors</th>
<th>Users (n=9)</th>
<th>Non-users (n=6)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hearing aid use in 1st implanted ear</strong></td>
<td>100% (9/9)</td>
<td>100% (6/6)</td>
<td>0% points</td>
</tr>
<tr>
<td><strong>Hearing aid use in 2nd implanted ear</strong></td>
<td>100% (9/9)</td>
<td>17% (1/6)</td>
<td>83% points*</td>
</tr>
<tr>
<td><strong>Presence of abnormal bony structures</strong></td>
<td>78% (7/9)</td>
<td>50% (3/6)</td>
<td>28% points</td>
</tr>
</tbody>
</table>

* Indicates statistically significant difference (p < 0.5)
Degree and configuration of hearing loss

Users

<table>
<thead>
<tr>
<th>Degree</th>
<th>Low Frequencies</th>
<th>High Frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Mod/Sev</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Profound</td>
<td>F</td>
<td></td>
</tr>
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Non-Users

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<th>Degree</th>
<th>Low Frequencies</th>
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</table>
Biggest differences between users and non-users:

* Time gap between first and second implant, and

* Hearing aid use (degree of hearing loss?) in the second-implanted ear
We propose...

• EARLY preparation of the possibility of implantation for families of children with EVA
  – Families are well-informed, prepared, and candidacy assessments completed in the case of sudden losses

• Hearing aid use in the non-implanted ear

• Implanting ears with EVA earlier than we might for others
  – Known progressive nature
  – Closely monitor speech recognition

• Simultaneous implantation (when appropriate)
Future directions

• Are there other important factors that were not considered within this study? (i.e. surgical)
• Can we use the BiCHIP (predictive tool) to help us predict these outcomes, or help counsel/advise these families?
• Speech recognition tracking for individual ears as well as binaural (to evaluate each ear’s individual contribution as well as binaural benefit).
• For children with EVA and an asymmetric loss, how ‘bad’ does each ear have to be to receive a cochlear implant?
References

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