Longitudinal Changes in Speech Recognition After Cochlear Implantation

Differences Between Group and Individual Patient Outcomes

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DISCLOSURES

• Envoy Medical (Advisory Board)

Funding:
• NIH/NIDCD: K23 DC016911
• American Cochlear Implant Alliance
• Speech scores will show rapid improvement over the first 3 to 6 months
  • Followed by plateau period, then scores remain stable

• Exact timing of plateau period is uncertain and may occur from 6 months up to 3 years post-implantation

• Individual performance is highly variable
AIM

1. Compare group and individual speech recognition performance trends post-implantation

2. Classify patients into different performance groups based on post-implantation speech recognition scores
METHODS

• Retrospective review of Cochlear Implantation Program database at Medical University of South Carolina (MUSC)

• Inclusion:
  • Bilateral, post-lingually deafened, first-time cochlear implant recipients
  • Adults (>18 years)
  • Pre-op and at least 2 post-op speech recognition scores

• Exclusion:
  • Younger than 18 years
  • Previous cochlear implant surgery
• Speech Recognition Instruments:
  • Consonant-Nucleus-Consonant (CNC) Words and Phonemes
  • AzBio-Sentences (In-Quiet)

• Group Analysis:
  • Mean and SD at pre-op and 3, 6, and 12 month post-op visits
  • Repeated measures ANOVA

• Individual Analysis:
  • Significant Change Analysis
  • Group Trajectory Modeling
## RESULTS

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
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<tbody>
<tr>
<td>Total Patients, n (%)</td>
<td>155 (100%)</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>90 (58.1%)</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>65 (41.9%)</td>
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<tr>
<td>Age at Implant, mean (SD)</td>
<td>67.9 (14.4)</td>
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<tr>
<td>Age of HL Onset, mean (SD)</td>
<td>46.2 (17.9)</td>
</tr>
<tr>
<td>Duration of HL, mean (SD)</td>
<td>21.5 (16.5)</td>
</tr>
<tr>
<td>Pre-implant HA Use</td>
<td>108 (69.7%)</td>
</tr>
<tr>
<td>Duration of HA Use, mean (SD)</td>
<td>17 (12)</td>
</tr>
</tbody>
</table>

Table 1. Patient Characteristics
GROUP ANALYSIS

CNC Words, mean (SD):
- Pre-op: 9.4% (12.3)
- 3 Months: 37.8% (18.8)
- 6 Months: 43.5% (21)
- 12 Months: 47.8% (20.3)

CNC-Phonemes, mean (SD):
- Pre-op: 20.7% (21.2)
- 3 Months: 60.1% (17.2)
- 6 Months: 64.3% (17.6)
- 12 Months: 68.9% (15.9)

AzBio Sentences In-Quiet, mean (SD):
- 13.7% (19.2)
- 52% (26)
- 57.2% (25.4)
- 61.6% (25.9)
CNC Words:

• Of 66 recipients analyzed, 33 (50%) improved until 3 to 6 months post-implantation, then plateaued.

• 15 recipients (22.7%) demonstrated no significant improvement within the first 3 months
  • 8 (12.1%) improved at later follow-up
  • 7 (10.6%) demonstrated no change

• 10 recipients (15.2%) improved significantly for the first 6 months, then showed no change after
AzBio Sentences (In-Quiet):

• Of 72 recipients analyzed, 34 (47.2%) improved until 3 to 6 months post-implantation, then plateaued

• 12 recipients (16.7%) demonstrated no significant improvement within the first 3 months
  • 6 (12.1%) improved at later follow-up
  • 6 (12.1%) demonstrated no change

• 11 recipients (15.3%) improved significantly for the first 6 months, then showed no change after
GROUP TRAJECTORY MODELING

AzBio Sentence Recognition In-Quiet

- Group A: n = 50 (39.1%)
- Group B: n = 47 (36.7%)
- Group C: n = 31 (24.2%)

PERCENTAGE CORRECT (%)

Pre-Op  | 3 Month  | 6 Month  | 12 Month

MUSC Health
Medical University of South Carolina
Changing What's Possible
DISCUSSION

• Mean score trends suggest that recipient performance post-implantation follows a uniform pattern of change
  • Only accounts for a portion of recipients

• Mean score may be a poor predictor of patient performance with limited utility in setting patient expectations
• Group Trajectory Modeling provides a more comprehensive picture of potential post-implantation performance

• Future focus: identification of factors that predict membership in each trajectory class
• Cochlear implant recipients tend to reach a plateau between 3 to 6 months post-implantation based on group trends

• Individual trends vary widely from group trends post-implantation
ACKNOWLEDGEMENTS

- Theodore McRackan
- Hong Li
- Shaun A. Nguyen
- Erick Yuen
- Judy R. Dubno

- MUSC Adult Cochlear Implant Team
  - Paul R. Lambert
  - Kara Leyzac
  - Ted Meyer
  - Habib Rizk
  - Liz Camposeo
  - Kaylene King
  - Mary Ann Howerton
  - Ryan Marovich

- NIH/NIDCD
- AICA
THANK YOU

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