Preservation of Hearing After Cochlear Reimplantation

Kylan Peterson, D.O.
PGY-V
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Genesys Regional Medical Center
"I am just as deaf as I am blind. The problems of deafness are deeper and more complex, if not more important than those of blindness. Deafness is a much worse misfortune. For it means the loss of the most vital stimulus—the sound of the voice that brings language, sets thoughts astir, and keeps us in the intellectual company of man."

"Blindness separates us from things but deafness separates us from people."

-Helen Keller

First direct stimulation of an acoustic nerve in 1950’s
First CI approved for adults for implantation in US was in 1984
1990—FDA approved use for 2 year-olds
1998—approved for 18 months
2000—approved for 12 months
External Components

- Microphone
- Speech Processor
- Transmitter
Internal Components

- Receiver/Stimulator
- Electrode Array
Advancement

► Advances in technology
  - Processing
  - Electrode Arrays

► Advances in surgical technique
  - Soft Technique

► Hearing Preservation
Soft Technique

► Complete all drilling before cochleostomy

► Minimize exposure time to the open cochlea

► Minimally traumatic cochleostomy
  ▪ Anterior/inferior to round window
  ▪ Make final entry into cochlea with a hook
  ▪ Don’t suction over cochleostomy
Soft Technique

- Advance Off Stylet (AOS) technique
- Slow insertion—30 seconds
- Seal cochleostomy as soon as possible
Hearing Preservation

- Theory—Loss of residual hearing from damage to cochlear structures (basilar membrane, stria vascularis etc) upon electrode insertion
- Hearing preservation would be worse for reimplantation of a CI
Hearing Preservation

- Few reports in literature
- Success rates of maintaining hearing thresholds after CI is around 35%
Case Presentation

► 77 year-old female presented with chief complaint of hearing loss
► Wearing bilateral hearing aids since 1990’s
  ▪ Becoming less effective
► Initially did not meet criteria for CI
► Referred to Cleveland Clinic for enrollment in hybrid CI trial
► Accepted but then trial suspended
Case Presentation

- Over time her hearing deteriorated
- Could not communicate by phone
- No benefit from HA’s
- Testing showed HINT score of 39%
- SRT’s: 80 right, 105 left
- Discrimination: 48% right, 12% left
Case Presentation

- Implanted with Nucleus 5 device
  - Successful
- HINT score 96%
- Residual bone scores on audiogram
  - 10 dB at 250 Hz
  - 30 dB at 500 Hz
Case Presentation

- Sixteen months later—Device Failure
- Elected to be reimplanted with Nucleus 24 device (full length electrode)
- HI NT score 81%
## HINT Scores at 70 dB SPL

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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Pre-op (Aided AU)</td>
<td>39%</td>
</tr>
<tr>
<td>Post CI</td>
<td>96%</td>
</tr>
<tr>
<td>Post Reimplant</td>
<td>81%</td>
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</tbody>
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## Audiogram Bone Scores

<table>
<thead>
<tr>
<th></th>
<th>250 Hz</th>
<th>500 Hz</th>
<th>1000 Hz</th>
<th>2000 Hz</th>
<th>4000 Hz</th>
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<tbody>
<tr>
<td>Pre-op</td>
<td>15</td>
<td>20</td>
<td>90</td>
<td>85</td>
<td>75</td>
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<tr>
<td>Post CI</td>
<td>10</td>
<td>30</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Post Reimplant</td>
<td>45</td>
<td>65</td>
<td>NR</td>
<td>NR</td>
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Conclusion

► Our case is unique

- Maintained residual hearing after implantation and once again after reimplantation
- Full length electrode on both occasions
References


