Outcomes With a Slim, Modiolar Cochlear Implant Electrode Array

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INTRODUCTION

• Slim, modiolar electrode array (CI532) released March 2016
• Pre-curved array inserted with a sheath
• Design Goals
  • Consistent perimodiolar placement in the scala tympani (ST)
  • Thin profile for atraumatic insertion
  • Easy insertion
Study Design

- **Purpose**
  - Describe initial surgical and audiological outcomes

- **Retrospective chart review- IRB approval obtained**

- **Postlingual adults implanted @ WUSTL (5/16 to 7/17)**
  - Exclusions: SSD, Pre- and Perilingual Onset, Prior otologic surgery
  - Demographics, Audiologic testing results, Operative details, Postoperative CT data collected
Surgical Technique

- Standard mastoidectomy and facial recess approach
- Wide Exposure of RW by removing overhang
- Round window incision or extended round window cochleostomy
- Electrode inserted with 2 handed technique-
  - Electrode/sheath alignment angle noted before insertion (video)
- Final position: 3 white markers outside cochlea
- Cochlear View Plain film Intraoperatively (Xu et al; 2000)
  - In the event of tip rollover, implant reloaded and reinserted
532 Sheath/Electrode Alignment
Results

• 151 patients implanted during study period
  • 89 males, 62 females
  • Mean Age=67.5 yrs
  • 77 Right, 74 Left

• Intraoperative Findings
  • 9 (6%) tip rollovers (8 intraoperative, 1 postop CT)
    • 4 right, 5 left
Audiologic Results: Az Bio

3 month Az Bio Quiet (N=58)

- Pre-op AZB-Q: 21.8%
- 3 mo AZB-Q: 63.6%

6 mo Az-Bio Quiet (N=58)

- Pre-op AZB-Q: 18.8%
- 6 mo AZB-Q: 62.6%
Audiologic Results: CNC

3 month CNC (N=56)

- Preop CNC: 12.8%
- 3 mo. CNC: 44%

6 mo CNC (N=44)

- Preop CNC: 9.3%
- 6 mo. CNC: 48.3%
Tip Rollover CNC Outcomes (N=6)

- Preop Avg: 15.3%
- 3 mo avg 40.6%
- 6 mo avg: 44.8%
- No statistically significant differences from non-rollover pts
Hearing Preservation

- 52 patients with preop 250/500 Hz threshold mean < 65 dB
  - 44% (23/52) preserved threshold average ≤ 85 dB at activation
  - 25% (10/40) preserved threshold average ≤ 85 dB at 3 mos
- Average 250/500 Hz mean threshold change
  - Preop 250/500 Hz average: 48.5 dB
  - Activation 250/500 Hz average: 89 dB (+40.5 dB change)
  - 3 month 250/500 Hz average: 99.7 dB (+51.2 dB change)
CT Reconstruction

• 29 patients had postop CT
  • Compared with preop CT and microCT atlas (Holden et al; 2013)
• Electrode location data collected
  • Scalar location
  • Insertion Depth
  • Wrap Factor
  • Angle of Insertion
Electrode Location

- 29 patients with available post-operative 3D CT reconstructions
- All arrays with full insertion
- 26 (90%) isolated ST (or ST/SM) locations
  - Wrap Factor: 58.2% mean (Range 53.3-64%)
  - Angle of Insertion: 415° mean (Range 360-466°)
- 3 (10%) Translocations: ST→SV
Translocation Cases

<table>
<thead>
<tr>
<th>#</th>
<th>Side</th>
<th>Apical Electrode</th>
<th>Crossover Angle (°)</th>
<th>Preop CNC (%)</th>
<th>Postop CNC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R</td>
<td>220</td>
<td>80</td>
<td>0</td>
<td>10 (3 mo)</td>
</tr>
<tr>
<td>2</td>
<td>R</td>
<td>405</td>
<td>120</td>
<td>2</td>
<td>86 (3 mo)</td>
</tr>
<tr>
<td>3</td>
<td>L</td>
<td>333</td>
<td>125</td>
<td>0</td>
<td>34 (1 mo)</td>
</tr>
</tbody>
</table>

Figures
CT Reconstructions of Implants with Electrodes in SV
1-3: Cochlear view of electrodes
1A-3A: Basal turn view of electrodes showing translocation

Patient 1- history of vestibular schwannoma resection
Plain Film and CT Reconstruction

Rolled Tip

Normal Insertion
Tip Rollover Patient

- Preop CNC 26%
- 1 mo CNC 46%
- 3 mo CNC 30%
- “Lots of racket”
- Reimplanted
Conclusions

- **Performance**
  - Early speech perception similar to previous reports of other devices
  - Hearing preservation possible but uncommon

- **Tip Rollovers**
  - *Not apparent on insertion*; mechanism unclear (Sheath-Array Misalignment?)
  - *Intraoperative Plain Film recommended*→Identified all but 1→resolved
  - Impact unknown- no statistical significance in our group(small N)

- **Array location**
  - Fewer cross-overs than other arrays
  - Tighter wrap factor
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