Intraday Electrode Impedance Variations in Cochlear Implants

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DISCLOSURE

Speaker

Relevant Financial Relationship(s)

No Relevant Financial Relationship(s)

Madison Graham, Au.D
The Problem: Impedance Information Gaps
Self Monitoring Impedances

14 Subjects
Unilateral/Bilateral
Clinically Fluctuating
Clinically Stable
Cochlear Corp. Device

Identify

Self-monitoring
AM/PM measures
More if they could
Range: 16-88 days
Average: 47.8 days

Monitor

Sent back
devices
Pulled data
Analyzed

Analyze

Determine
individual
patterns

Compare
## Self Monitoring: Unilateral

<table>
<thead>
<tr>
<th>Patients</th>
<th>Range (kΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI1</td>
<td>20</td>
</tr>
<tr>
<td>CI2</td>
<td>11</td>
</tr>
<tr>
<td>CI3</td>
<td>6</td>
</tr>
<tr>
<td>CI4</td>
<td>2</td>
</tr>
<tr>
<td>CI5</td>
<td>5</td>
</tr>
<tr>
<td>CI6</td>
<td>10</td>
</tr>
<tr>
<td>CI7</td>
<td>7</td>
</tr>
<tr>
<td>CI8</td>
<td>9</td>
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</tbody>
</table>

N = 8 (Unilateral)
Self Monitoring: Bilateral

<table>
<thead>
<tr>
<th>Patients</th>
<th>Range (kΩ)</th>
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<tbody>
<tr>
<td>CI9R</td>
<td>13</td>
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<tr>
<td>CI9L</td>
<td>1</td>
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<tr>
<td>CI10R</td>
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<td>CI10L</td>
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<td>CI11L</td>
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</tbody>
</table>

N = 3 (Bilateral)
Clinical Measurements vs. Serial Self Monitoring

Comic Strip vs. Flip Book

Clinical Measurements

Self-Monitoring Measurements
Types of Patterns

Rising, Falling, & Stable
What Makes Sense…

Falling

Rising

- Surgical
- Initial Activation
- After Activation

AM
PM

?
Pattern: Rising

A

B

C

D

E

F

G

Impedance (kΩ)

Electrode

Date: 7/29/2019

Date: 12/3/2019

Date: 6/24/2020

Date: 7/13/2020

Date: 11/15/2019

Date: 2/7/2020

Date: 5/31/2020

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Pattern: Falling

A

B

C

Impedance (kΩ)

Date: 3/1/2020

CI3

Date: 12/14/2020

CI5

Date: 12/5/2019

CI7

Electrode
Pattern: Stable
By filling in some of these impedance gaps, we found...

- Fluctuations can be episodic in some users
- They can occur unilaterally (demonstrated by 3 bilaterally implanted patients)
- While some impedances fall throughout the day with electric stimulation, others rise.
- There are different mechanisms at play during impedance fluctuations
Our answers lead to more questions…

• Potential causes of these fluctuations?
  • Ideas: hormone therapy, Meniere’s Disease, electrode extrusion, stress

• Potential treatments?
  • Ideas: Steroids, device rest, parameter changes

• Specific patterns with specific treatments?

• Future of serial impedance measurements?
  • Ideas: App based impedance measurements and compliance alerts
Questions & Discussion
References:


