First Experience With A New Thin Lateral Electrode Array

Thomas Lenarz, Nils Prenzler, Rolf Salcher, Andreas Büchner

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Dept Otolaryngology, Medical University Hannover
Chairman: T Lenarz, MD PhD
Requirements for modern CI Electrodes

- Good structure preservation
- Sufficient number of stimulation channels
- Sufficient spectral coverage with > 360° insertion angle
- Easy insertion process through round window
- Good visibility during insertion
- Minimal volume displacement during insertion by smallest possible diameter and sufficient pushability
- Fixation mechanism to avoid electrode migration
Key Design Features

Dimensions

- Array length 23 mm (from marker till tip)
- Cross-section at distal electrode 0.55 x 0.25 mm
- Cross-section at proximal electrode 0.76 x 0.55 mm
- Electrode curvature 3.5 mm
Anatomical study MHH

- 10 temporal bones
  - ‘fresh frozen’
  - Intact facial recess
- Surgeon`s decision on approach
  - Round window, modified/extended round window, cochleostomy
- Surgeon to note position of blue marker, ease of insertion, handling of the electrode, use of the wing, etc.
Results

Surgical Approach

• 8 insertions through round window (round window slit), 2 extended round window
• Lenarz’ Forceps
• Slit in inferior portion of facial recess to fix wing

Results

• Trauma rating according to Eshragi scale
• Overall easy insertions, good visibility of the electrode during insertion

<table>
<thead>
<tr>
<th>TB nb</th>
<th>TB 1</th>
<th>TB 2</th>
<th>TB 3</th>
<th>TB 4</th>
<th>TB 5</th>
<th>TB 6</th>
<th>TB 7</th>
<th>TB 8</th>
<th>TB 9</th>
<th>TB 10</th>
<th>Avg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. trauma rating</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
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<tr>
<td>Angular Insertion depth (cochlear coordinate system)</td>
<td>450</td>
<td>441</td>
<td>441</td>
<td>447</td>
<td>426</td>
<td>430</td>
<td>411</td>
<td>417</td>
<td>427</td>
<td>432</td>
<td>432</td>
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<tr>
<td>Position blue marker (x mm out)</td>
<td>0</td>
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<td>0.5</td>
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<td>0</td>
<td>0</td>
<td>0.3</td>
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</tbody>
</table>
Histology examples

Trauma grade 0, TB08

Trauma grade 1, TB10
Angular insertion depth 10 bones
- 432° (from Round window) Range: 411 – 450 degrees

Example: TB01 (insertion depth 450 degrees from RW)
Summary

• CI electrode array should preserve intracochlear structure and have sufficient spectral coverage.

• 23mm slim lateral electrode array is suitable to achieve both goals, based on anatomical data.

• Final design version:
  • 23mm long
  • Thin cross section at apical and middle section,
  • Tip for easy RW insertion
  • Wing for good handling, optionally for fixation

• Anatomical study shows good results (10/10 percent of ST insertion, 430 degree insertion depth, very consistent placement).

• Further follow up by clinical evaluation starting soon.