Indications for Subdural Grids versus SEEG versus Depth Electrodes

December, 2012

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Cleveland Clinic

American Epilepsy Society  |  Annual Meeting
Disclosure

None
Learning Objectives

• Discuss specific indications for subdural grids/strips and SEEG in the diagnosis and treatment of refractory focal epilepsy
Differences among depth electrodes, subdural grids with depths and SEEG
Subdural Method Advantages

- “Standard procedure” in North America.
- Optimal coverage of the subdural space adjacent cortex.
- Anatomical relation between cortex and electrode is easily understood.
- Adequate functional mapping capabilities.
- Open procedure, better management of possible intra-operative complications.
- Resection planning is simple to understand.
- Mapping and resections are performed during the same hospital admission.
Pre op MRI

Intra-op aspect

Post op Grid-MRI Co-Registration
Subdural Method Disadvantages

• Poor coverage of deep located cortex.
• Precise anatomical placement in basal and mesial cortex is unpredictable.
• Invasive method (complications can reach 10-15% in some series).
• Poor 3D view.
• Bilateral implantations are more challenging.
SEEG after Subdurals

Follow-up: 20 months

SF: 6/10

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<table>
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<tr>
<th>Pt</th>
<th>Hypothesis</th>
<th>Electrodes #</th>
<th>Covered area</th>
<th>Functional Map</th>
<th>Ictal activity</th>
<th>Resection</th>
<th>Histology</th>
<th>Outcome Class</th>
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Gonzalez-Martinez et al., submitted
SEEG Method Advantages

- Precise and accurate mapping of deep cortical areas.
- 3D aspect of the hypothetical EZ.
- "less invasive". 3-5% complication rate.
- Electrode implantation is predictable.
- Intra-cortical recordings.
- Bilateral implantations are straightforward.

Gonzalez-Martinez et al., 2012; Cossu et al., 2005; Talairach et al., 1972
30 y.o. Visual aura and dialeptic seizures
The 3D Mapping the EZ network
SEEG Disadvantages

- Contiguous superficial coverage is poor.
- Superficial functional mapping is challenging, requiring speculation of the anatomical limits of a specific functional area.
- Imprecise interface between the hypothetical EZ and functional areas (mainly speech).
- Anatomical-electrophysiological correlation and the 3D aspect of the EZ are difficult to understand.
- “Blind” procedure. Poor control of IC bleedings.
Language Mapping

S 1 2 3 4 5 6 7 8 9 10 11 12
N 1 2 3 4 5 6 7 8 9 10 11 12
W 1 2 3 4 5 6 7 8 9 10 11 12
H 1 2 3 4 5 6 7 8 9 10 11 12
M 1 2 3 4 5 6 7 8 9 10 11 12
R 1 2 3 4 5 6 7 8 9 10 11 12
Z 1 2 3 4 5 6 7 8 9 10 11 12

Upper extremity
Motor
Lower extremity
Face

Upper extremity
Sensory
Lower extremity
Face

Negative Motor
Eye field
Language
Stimulated
## Impact on Clinical Care and Practice

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<th>Clinical scenario</th>
<th>Method of Choice</th>
<th>Second Option</th>
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<td>SBG</td>
<td>SEEG</td>
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<td>Normal MRI: Hypothetical EZ located in the proximity of eloquent cortex (mainly speech).</td>
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<td>Lesional MRI: Lesion is deep located.</td>
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<td>SBG with depths</td>
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<td>Normal MRI: hypothetical EZ is deeply located or located in non-eloquent areas.</td>
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