Mapping the Epileptogenic Zone with SEEG

December 4, 2012

Philippe KAHANE, M.D., Ph.D.
Neurology Department & INSERM U836
Grenoble University Hospital, France
Disclosure

GlaxoSmithKline  Consulting - Speaker
Actelion Pharmaceuticals  Consulting
UCB-Pharma  Speaker
The epileptogenic zone

The minimum amount of cortex that must be resected (inactivated, completely disconnected) to produce seizure freedom (Lüders et al. 2006).
The epileptogenic zone

How to map it with SEEG?
The epileptogenic zone

Bancaud and Talairach view
The epileptogenic zone

Bancaud and Talairach view

Seizure was the symptom to be cured: it was the region of the cortex generating seizures that had to be defined *electrophysiologically*, and translated into anatomical terms.

SEEG definition (Munari and Bancaud, 1987):

*the site of the beginning and of the primary organization of epileptic seizures*

ZE: ictal onset zone + early seizure spread
**Ictal onset**

Fast synchronizing (40-500Hz) discharge at seizure onset


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**R insular seizure**

**OrbF**

**DLFcx**

**SSOp**

**Insula**

**TNcx**

**MesT**

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Clinical onset of the seizure
Ictal onset

Fast synchronizing (40-500Hz) discharge at seizure onset

Ictal onset

Fast synchronizing (40-500Hz) discharge at seizure onset
Ictal onset

Fast synchronizing (40-500Hz) discharge at seizure onset
Ictal onset

Imaging the seizure onset zone with SEEG (David et al. 2011)
R F lobe seizure

Imaging the seizure onset zone with SEEG (David et al. 2011)

Ictal onset
Imaging the seizure onset zone with SEEG (David et al. 2011)

R T lobe seizure

Ictal onset
Seizure spread

Delay **AND** Fast discharge

onset → early spread

secondary involvement
Seizure spread

Electrically-induced seizures

1 Hz ES [3ms / 0.2-3mA / 40s]

50 Hz ES [1ms / 0.2-3mA / 5s]
Seizure spread

<table>
<thead>
<tr>
<th>Location</th>
<th>Onset</th>
<th>25 sec</th>
<th>Spread</th>
<th>Clinical onset (mouth tingling)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orbito-F</td>
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<td>Operc</td>
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<td>Insula</td>
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<tr>
<td>Mesio-T</td>
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<td>Lateral T</td>
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</tbody>
</table>

- **Onset**
- **25 sec**
- **Spread**
- **Clinical onset (mouth tingling)**

- **Hc ES – 1 Hz – 3mA**
  - ➞ electro-clinical seizure
- **Ins ES – 50 Hz – 1mA**
  - ➞ aura (mouth tingling)
Seizure spread

Onset  Spread

CG  RG  Orb  Fop  FP  Ins
Lateral T  Mesio-T
Seizure spread

Electrically-induced seizure

Amygd
Ant Hc
T-basal
T-O
2dTG
1stTG

Onset

Spread

50 Hz – 1mA
Seizure spread

Can we go further?

Epileptogenicity of brain structures in human temporal lobe epilepsy: a quantified study from intracerebral EEG

Fabrice Bartolomei,1,2,3 Patrick Chauvel1,2,3 and Fabrice Wendling4,5 2008

El values (averaged over the patients)

<table>
<thead>
<tr>
<th>Brain structure</th>
<th>aHIP</th>
<th>EC</th>
<th>pHIP</th>
<th>AMY</th>
<th>iTP</th>
<th>eTP</th>
<th>aMTG</th>
<th>pMTG</th>
<th>STG</th>
<th>INS</th>
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</thead>
<tbody>
<tr>
<td>Hippocampal sclerosis</td>
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<td>Normal MRI</td>
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Mapping the EZ with SEEG