Deep Brain Stimulation: A Pacemaker For the Brain

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Goals of Neuromodulation and Restorative Neurosurgery

Patient-specific therapies
Improve Quality of Life
## Historical “restorative” neurosurgery

### Pioneers

<table>
<thead>
<tr>
<th>Walter Freeman MD</th>
<th>Irving Cooper MD</th>
<th>Lars Leksell MD</th>
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<tbody>
<tr>
<td><em>Psychosurgery</em></td>
<td><em>Movement disorder surgery</em></td>
<td><em>Stereotactic surgery</em></td>
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<td>“Ice Pick”</td>
<td>AChA Ligation</td>
<td>Pallidotomies</td>
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<tr>
<td>Lobotomy</td>
<td>Cryosurgery</td>
<td>Human Stereotaxy*</td>
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<td><em>Gamma Knife</em></td>
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<td><em>Preceded by Spiegel and Wycis</em></td>
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*Preceded by Spiegel and Wycis*

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Eloquent treatments that universally required **damaging the brain**
Current Practice:
Deep Brain Stimulation

Advantages:
(1) Reversible
(2) Modulatable
Deep Brain Stimulation
Multiple Stages of Surgery

- Preoperative Evaluation
  - Neurological
  - Psychocognitive
  - Neurosurgical
  - General Medical

2 - 3 months

- Stereotactic Planning
  - MRI and/or CT
  - Frame Placement – Frame or “Frameless”
  - Lead Implantation
  - Generator Implantation

1 day – 3 months

3-6 Months +

- Programming
Programming: Requires 3-6 months of visits

1. Amplitude (0-10 volts)
2. Pulse width (msec)
3. Frequency (130-185 Hz)
4. Electrode configuration
   - Pseudomonopolar (-)
   - Bipolar (+-)
   - Guarded cathode (+-+)

Contacts

Monopolar

Bipolar
DBS for Movement Disorders: The Numbers

In the US...

650,000 people with Parkinson’s
100,000 people with dystonia
1.2 million people with essential tremor

180,000 potential surgical candidates

~100,000 patients implanted with DBS worldwide
Who’s a Good Candidate?

1. Diagnosis of tremor
2. Medications have failed
3. Tremor Interferes with Quality of Life...
4. Medically suitable for surgery
   Able to tolerate a 3-6 hours of awake surgery
5. Realistic expectations and interest
Patient expectations

- DBS is not a cure
- Not everyone is a good DBS candidate
- DBS is only appropriate if the tremor is a major source of disability
- DBS does not work instantly
- DBS is part of a multidisciplinary management scheme
- DBS has three types of risks: Perioperative, Equipment related, and Stimulation related complications
**DBS: Beyond Movement Disorders**

*using our knowledge of functional anatomy and brain mapping*

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<tr>
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<th><strong>Psychiatric</strong></th>
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<td><strong>Obsessive-Compulsive Disorder</strong></td>
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<td><strong>Essential Tremor</strong></td>
<td><strong>Depression</strong></td>
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<td><strong>Dystonia</strong></td>
<td><strong>BA25, VC/VS</strong></td>
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<td><strong>Tourette’s</strong></td>
<td><strong>VC/VS</strong></td>
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<th><strong>Pain</strong></th>
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<tr>
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<td>Cluster headache</td>
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<td>Non-lateralizing MTS</td>
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<th><strong>Others</strong></th>
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<td>Alzheimer’s Disease</td>
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<td>Minimally Conscious State</td>
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<td>Obesity</td>
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**FDA approved**
UCLA Neurosurgical Movement Disorders Program

**Faculty**

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**Neurology**
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Dolly West

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Allan Wu, MD
Arik Johnson, PsyD