DEEP BRAIN STIMULATION FOR PD:
COLUMBIA PARKINSON'S SUPPORT GROUP SYMPOSIUM

• Disclosures: None
PARKINSON’S DISEASE

- Affects 0.3% of general population
- Cardinal features
  - Resting tremor
  - Rigidity
  - Bradykinesia
  - Postural instability
PD: □ DA neurons in SNC
Direct Pathway:
Inhibitory activity to GPi

Indirect Pathway:
- Inhibitory activity to GPe
- Inhibitory activity to STN
- Excitation to GPi

Together:
- Inhibitory activity from GPi to thalamus and brainstem
  = Hypokinesis

TREATMENT OPTIONS

- 1) Nothing- Observation

- 2) Medication Only
  - 40% pts develop marked motor “on-off” fluctuations and drug-induced dyskinesias after 5 years of medical treatment*

- 3) Surgery:
  - Targets for therapy:
    - STN vs GPi vs VIM
  - Ablative (permanent)
Ablative (permanent)
- Thermocoagulation
- Gamma Knife
- MRI guided High-Focused Ultrasound

Non- ablative (non-permanent)
- Deep Brain Stimulation
  - Gold standard of treatment for medication failure or intolerant of side effects


HISTORY OF DBS

- Father Functional Neurosurgery, Sir Victor Horsely, 1890s
- Modern stereotactic surgery, Dr. Lars Leksell, 1948
- Modern age of DBS pioneered in 1987 by Benabid et al.
- Approved by US FDA as treatment for PD 2002
A Randomized Trial of Deep-Brain Stimulation for Parkinson’s Disease

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- 156 pts
- DBS + meds vs meds only, 6 months
- Greater improvement in PDQ-39 and UPDRS-III w DBS, mean 9.5 and 19.6 pts better
- Improvement in 24-38% in PDQ-39 subscales: motility, ADLs, emotional well being, stigma, bodily discomfort

Bilateral Deep Brain Stimulation vs Best Medical Therapy for Patients With Advanced Parkinson Disease
A Randomized Controlled Trial

Frances M. Weaver, PhD

- 255pts
- DBS + meds vs meds alone, 6 months
- Pts w DBS gained a mean of 4.6h/d of “on” time w/o troublesome dyskinesia
- Significantly improved
Significantly improved
- Motor function
- Quality of life measures
- Phonemic fluency
- Cognitive changes
- Small decrements w DBS
- Not statistically significant

Deep brain stimulation plus best medical therapy versus best medical therapy alone for advanced Parkinson’s disease (PD SURG trial): a randomised, open-label trial

Adrian Williams*, Steven Gill, Thelekat Varma, Crispin Jenkinson, Niall Quinn, Rosalind Mitchell, Richard Scott, Natalie Ives, Caroline Rick, Jane Daniels, Smita Patel, Keith Wheatley*, on behalf of the PD SURG Collaborative Group†

Lancet Neurol 2010; 9: 581-91

366 pts
DBS + meds vs meds only, 1-yr
PDQ-39 summary index score
5pts in DBS vs 0.3pts in medical therapy (p=0.001)
PDQ-39 score mobility domain
Mean change pro DBS -8.9
(p=0.0004)
PDQ-39 score ADL domain
Mean change pro DBS -12.4
(p<0.0001)
PDQ-39 score bodily discomfort pain
Mean change pro DBS -7.5
(p=0.004)
SAFETY


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<tr>
<th>SAFETY</th>
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<tbody>
<tr>
<td>Chronic changes such as:</td>
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<tr>
<td>● mania</td>
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<tr>
<td>● depression</td>
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<tr>
<td>● apathy</td>
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<tr>
<td>● panic</td>
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<td>● impulsivity</td>
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<td>● anxiety</td>
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<td>● hallucinations</td>
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<thead>
<tr>
<th>TABLE 2. Adverse Events*</th>
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<tr>
<td>Total (n = 510)</td>
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<tr>
<td>No. of Electrodes</td>
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<tr>
<td>Procedure</td>
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<td>ICH</td>
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<td>Symptomatic ICH</td>
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<td>Hypoglycemic ICH</td>
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<td>SDH</td>
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<td>Postoperative seizure</td>
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<td>Mental status change</td>
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<tr>
<td>Stimulation</td>
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<tr>
<td>Speech disturbance</td>
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<tr>
<td>Ballism</td>
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<tr>
<td>Eyelid apraxia</td>
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<tr>
<td>Corticospinal effects</td>
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<tr>
<td>Total</td>
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</tbody>
</table>

*CSF, cerebrospinal fluid; GPI, globus pallidus interna; ICH, intracranial hemorrhage; SDH, subdural hematoma; STN, subthalamic nucleus; VIM, ventralis intermediate nucleus.

*Unless otherwise noted, statistical significance was determined using the Fisher exact test.

Statistically significant at P < .05 indicated in bold.
• suicidal ideations
• All likely multifactorial related to:
  • medication changes
  • Neuronal plasticity following DBS
  • Adaptation difficulties
  • Dramatic sociofamilial modification
• These issues need to be screened for and managed with a multidisciplinary approach

PREOPERATIVE EVALUATION

• Movement Disorder Neurologist
  • Initial Evaluation for surgical candidacy
  • Good Candidate:
    • Reasonable cognitive function
    • Adequate dopaminergic response while showing:
      • “On-off” fluctuations
      • Dyskinesia
      • Medication-resistant tremor
    • Realistic goals:
      • Not a cure
      • Likely to improve and remain stable for at least 4 years:
        • Levodopa-responsive symptoms:
          • Dyskinesias
          • Tremor
          • “On-Off” fluctuations
      • Less likely to improve
        • Speech
        • Balance/ Gait
        • Cognition

PREOPERATIVE EVALUATION

- Surgeon
- Primary Medical Physician
  - Medical Clearance
- MRI

STAGE 1: DAY OF OR

- Preop Holding
  - Meet anesthesia
- Frame application then to CT
IN OPERATING ROOM

- Positioned onto OR table
  - Skin steriley prepped and draped
PLANNING

- Administration of local anesthetic in scalp
- Incision
- Burr hole(s)
- Microelectrode recording
• Intra Operative CT
• Placement of Lead w testing

• Intra Operative CT
  ● Confirm placement
• Closure of skin
• Removal of Frame
• Overnight admission into ICU

STAGE 2

• Return to OR ~1 week
  ● Placement of extension leads and generators
• Return to Neurologist in ~2-4 weeks
  ● Initial programming
  ● May need subsequent sessions
LIVING WITH A STIMULATOR

- Handheld programmer
  - Able to turn stimulator off/on
  - May be able to change programmed settings/ adjust strength of stimulation
- Lifespan of generators
  - 5-7 yrs
- Be wary of MRIs
  - May turn stimulator off/on, change settings
- These will not affect generators
  - Cellular phones
  - Pagers
  - Microwaves
  - Security doors
  - Anti-theft sensors
THANK YOU!