Deep Brain Stimulation for Parkinson's Disease

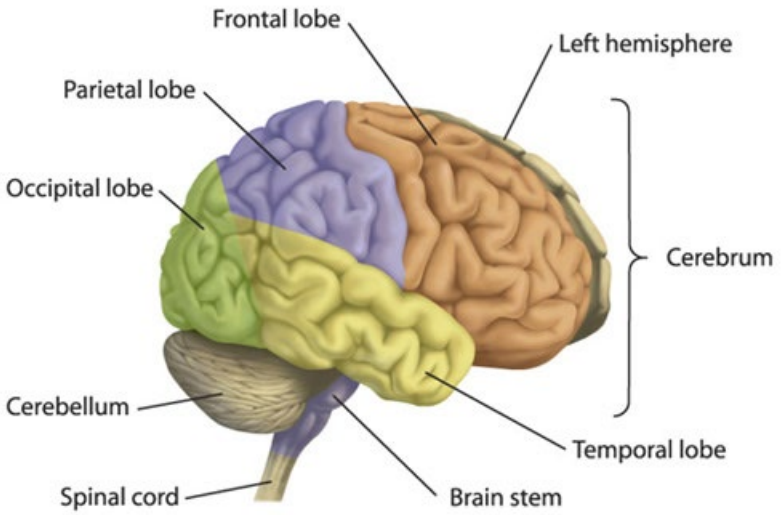
Josue Avecillas-Chasin MD, PhD

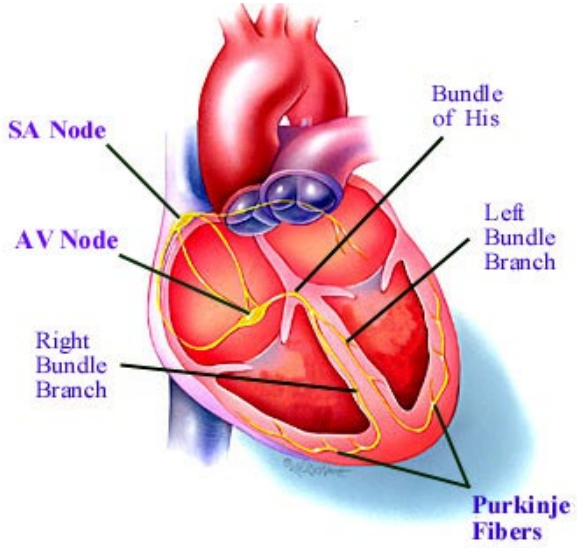
Stereotactic and Functional Neurosurgeon

Assistant Professor of the Department of Neurosurgery

University of Nebraska Medical Center

What is DBS?



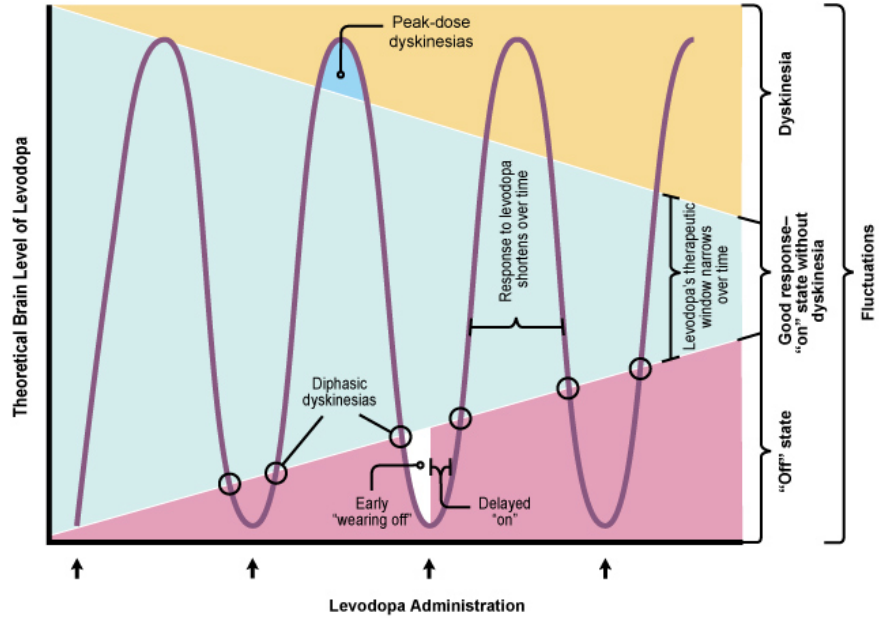


The Brain, much like the Heart is an electrical organ

Deep Brain Stimulation (DBS)>>*Brain Pacemaker*

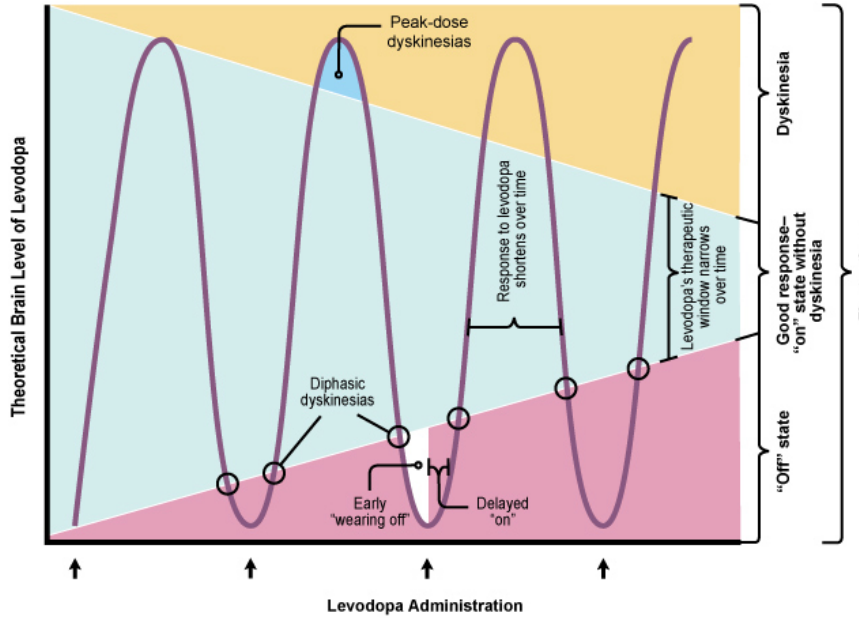
When to Consider DBS

- Too much “off” time…“up and downs”



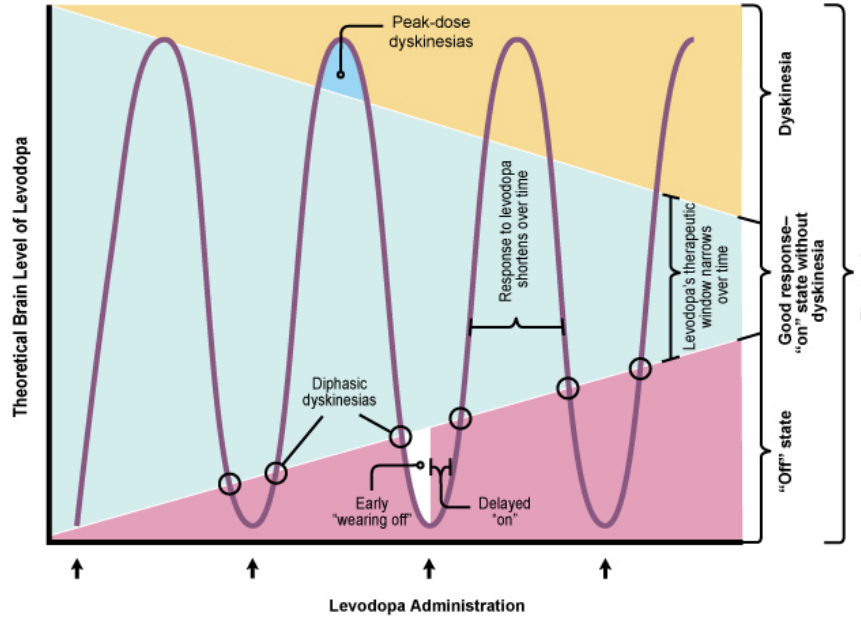
When to Consider DBS

- Too much “off” time…“up and downs”
- Intolerable side-effects



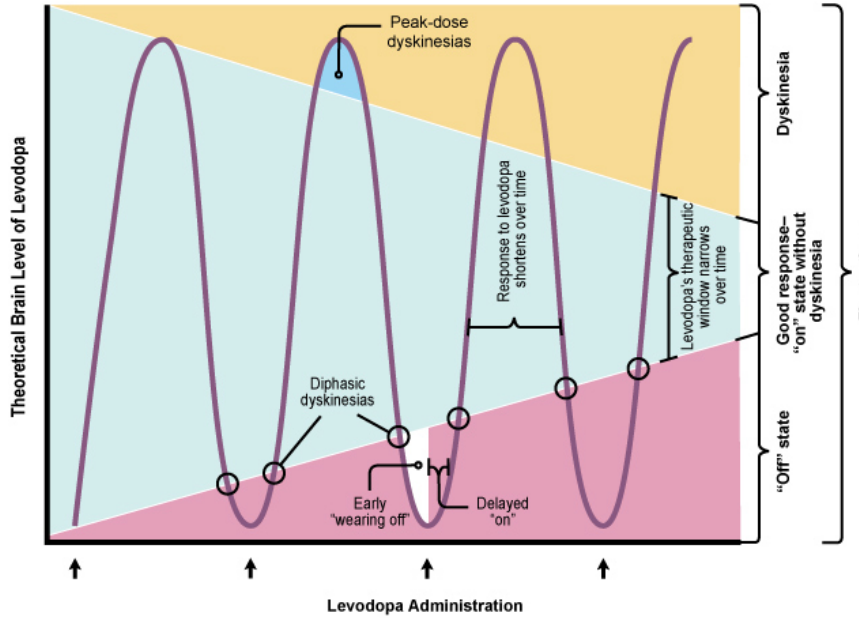
When to Consider DBS

- Too much “off” time…“up and downs”
- Intolerable side-effects
- Insufficient tremor control
- Troublesome dyskinesias



When to Consider DBS

- Too much “off” time…“up and downs”
- Intolerable side-effects
- Insufficient tremor control
- Troublesome dyskinesias
- Thinking about stopping hobbies/job



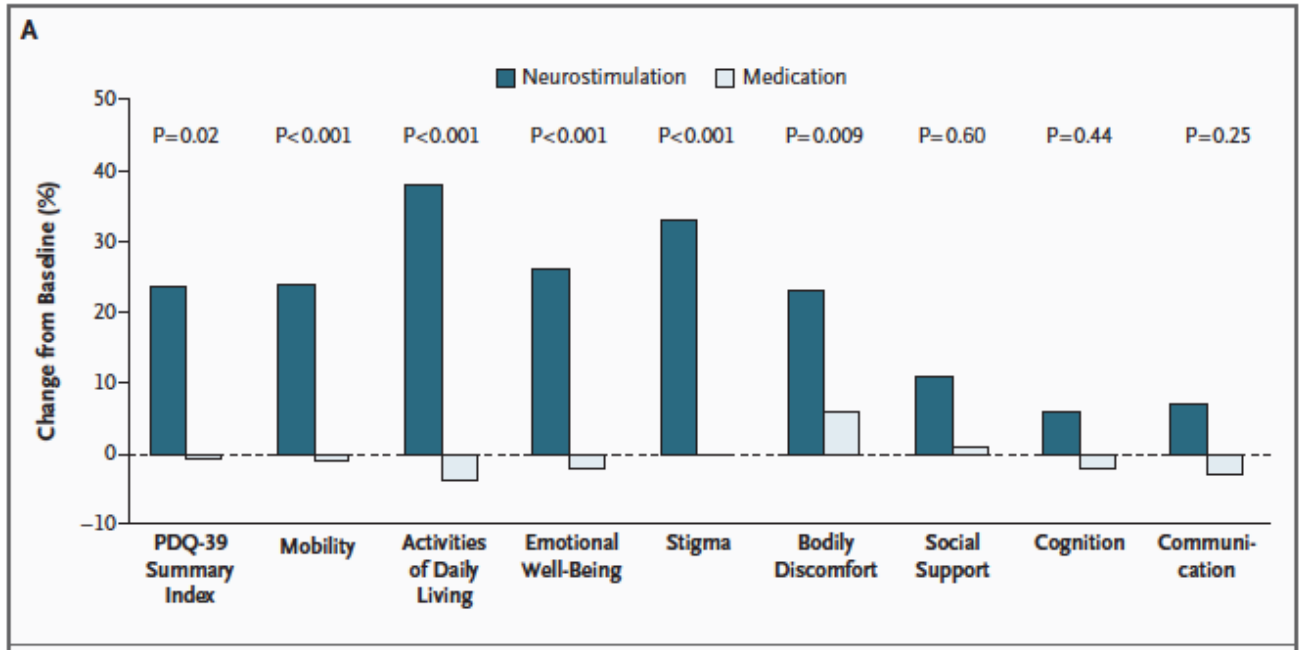
How we define candidacy?: Team

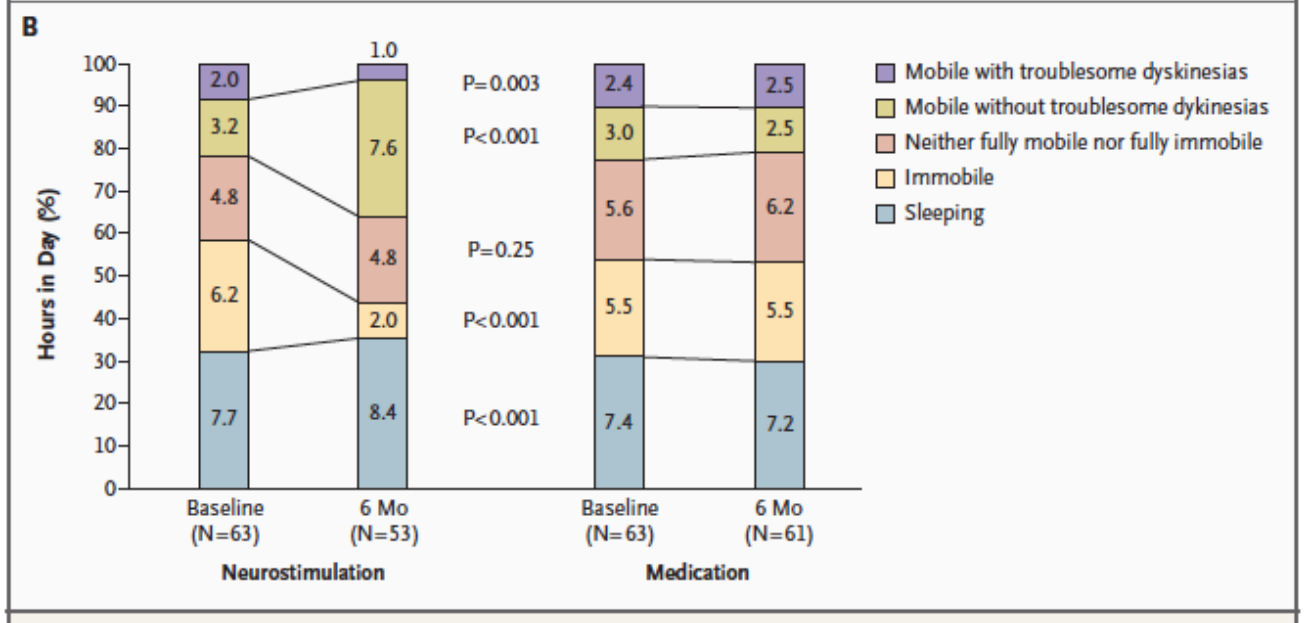
- Neurologists
- Neurosurgeons
- Neuroradiologists
- Neuropsychologists
- Advanced practice providers
- Anesthesiologists
- Neurophysiologists
- Psychiatrists

How we define candidacy?: Workup

- History & Neurological examination
- Levodopa responsiveness ON/OFF
- UPDRS Scales
- Imaging
- **Diagnosis**
- **Co-morbidities: Psychiatric**
- Quality of life: work and personal life
- Conservative treatments tried
- Neuropsychological evaluation

Clinical Results of DBS





The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of Deep-Brain Stimulation for Parkinson's Disease

Günther Deuschl, M.D., Ph.D., Carmen Schade-Brittinger,

DBS is surgery of Last Resort?


DBS is surgery of Last Resort?

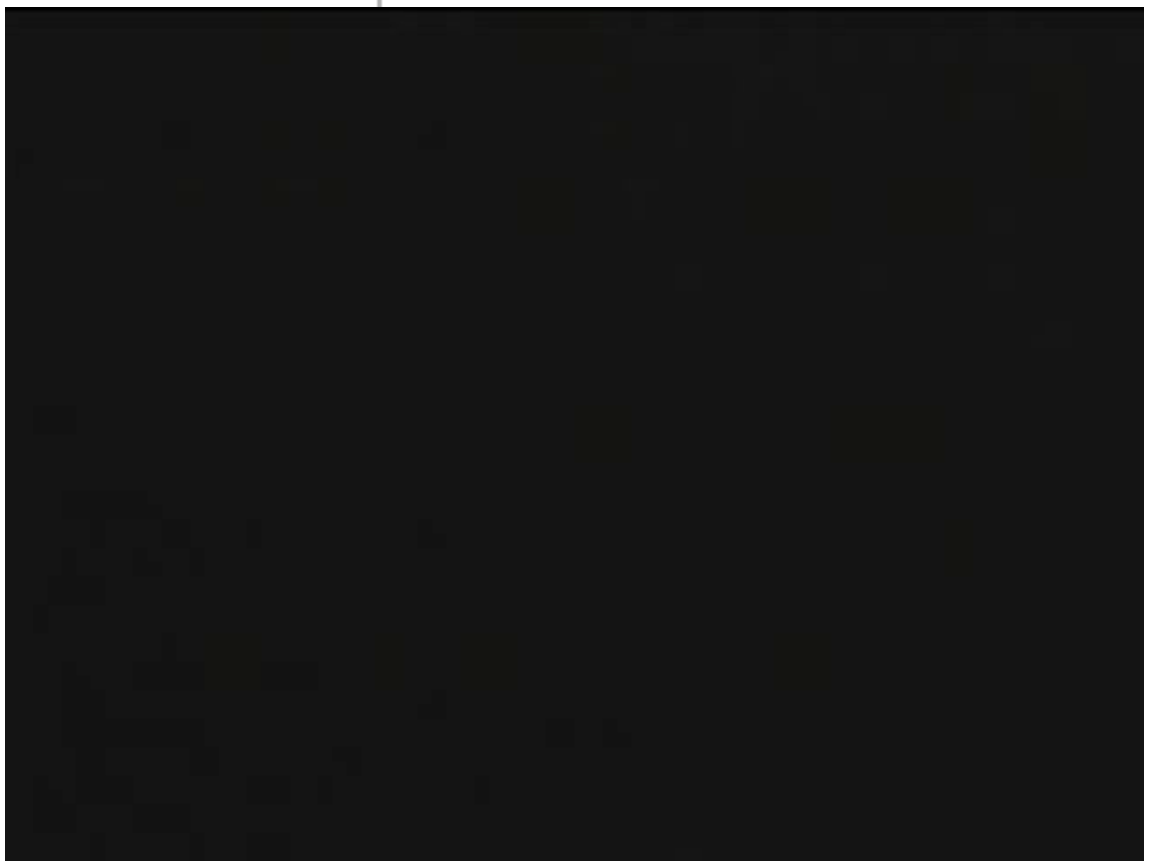
It's **not** about getting patients out of the nursing home, it's about getting patients back on the golf course. . .

…..I waited too long….

It's **not** about getting patients out of the nursing home, it's about getting patients back on the golf course. . .

Parkinson's disease

Parkinson's disease



Goals of DBS

- To Improve quality of life>> symptomatic treatment
- Not Cure
- Hope for medically intractable patients

Expectations

- 70% reduction in dyskinesias
  - 50% medication reduction
- 80% reduction in resting tremor (Essential tremor)
- 60% reduction in bradykinesia
- 70% reduction in rigidity
- 60-70% reduction in dystonia

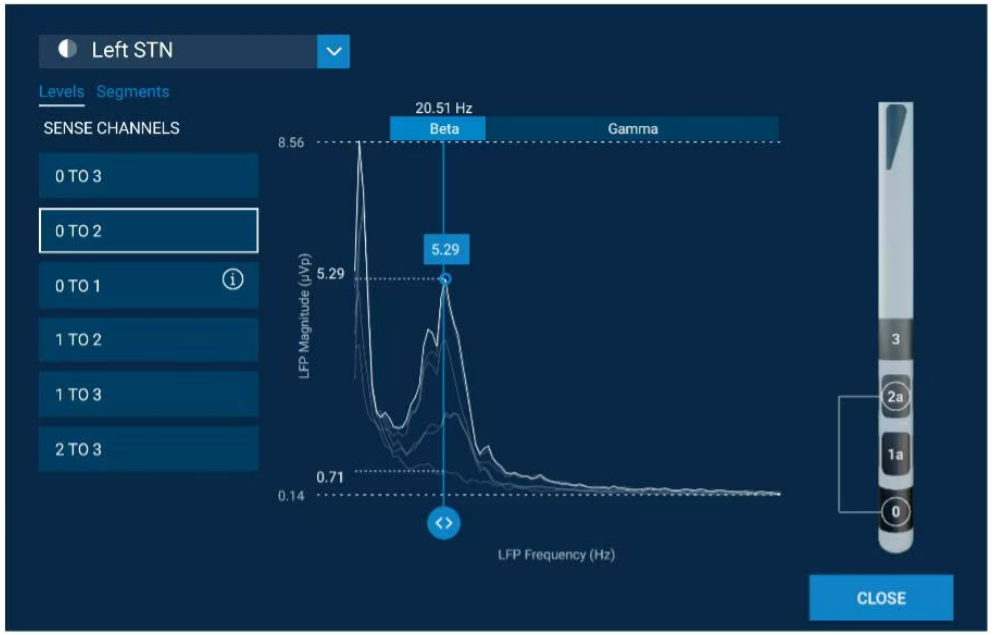
- 70% improvement in peak ON-time
- 70% reduction in worst OFF-time

Expectations

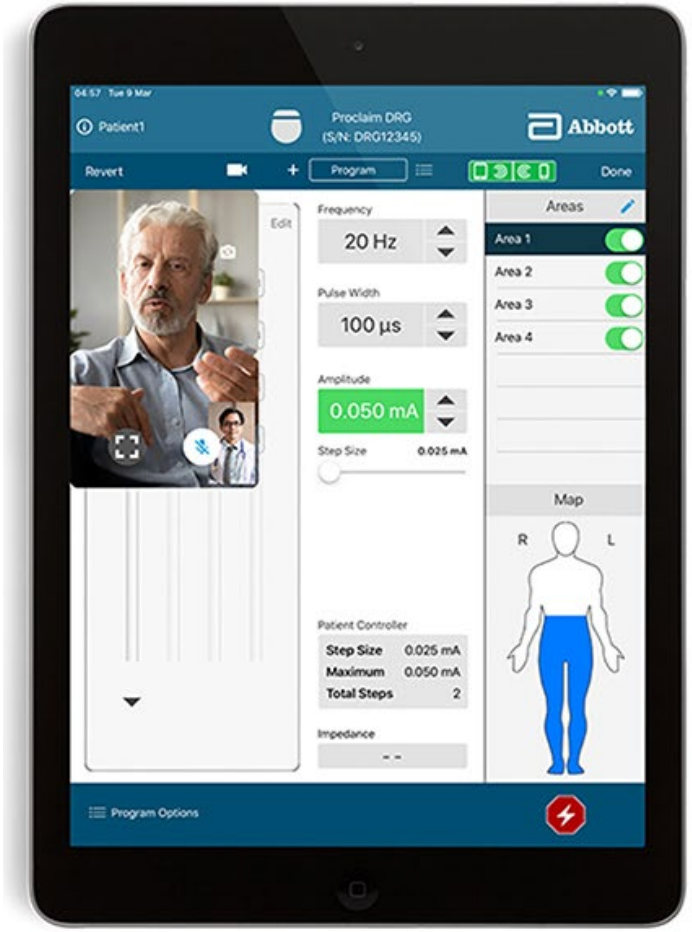
- Freezing of gait (especially ON-freezing)
- Axial Instability
- Balance issues (Tend to avoid STN)
- Cognitive issues (?)
- Apathy (?) (Better with STN)
- Depression and anxiety (?)

Before surgery

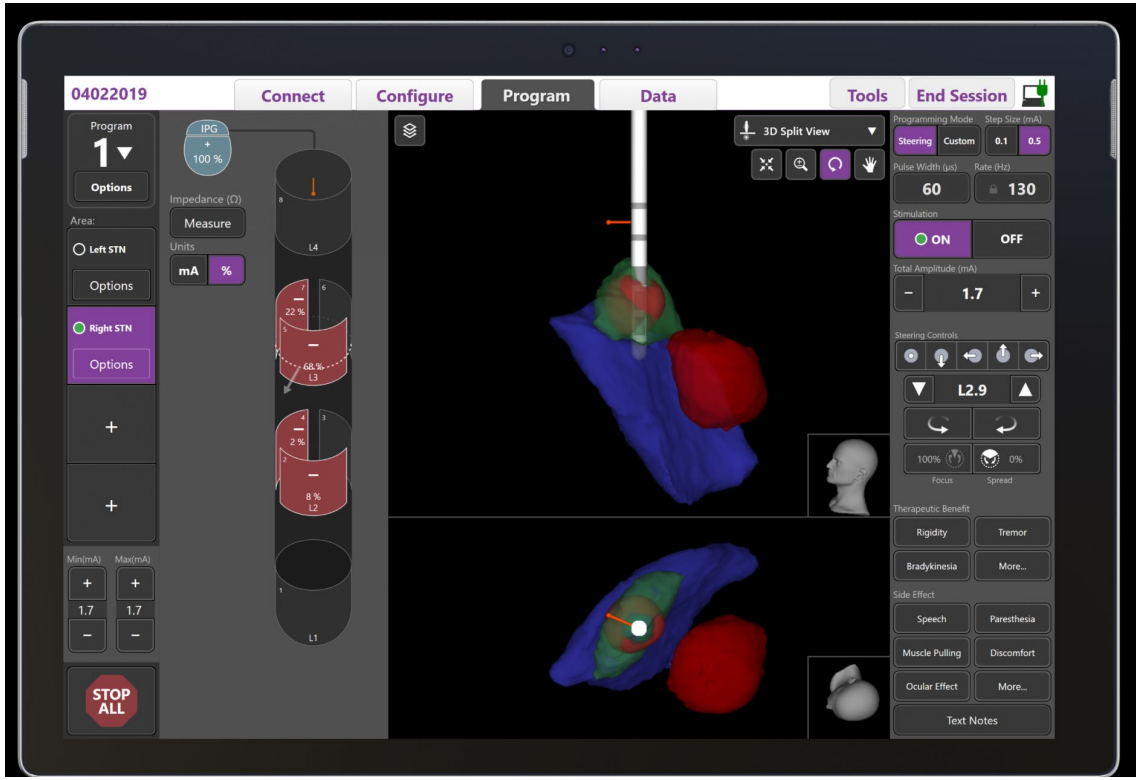
The Device: Medtronic



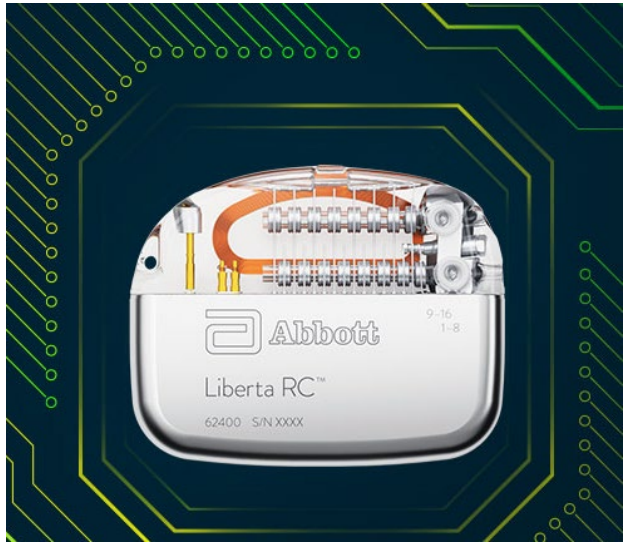
The Device: Abbott



The Device: Boston Scientific

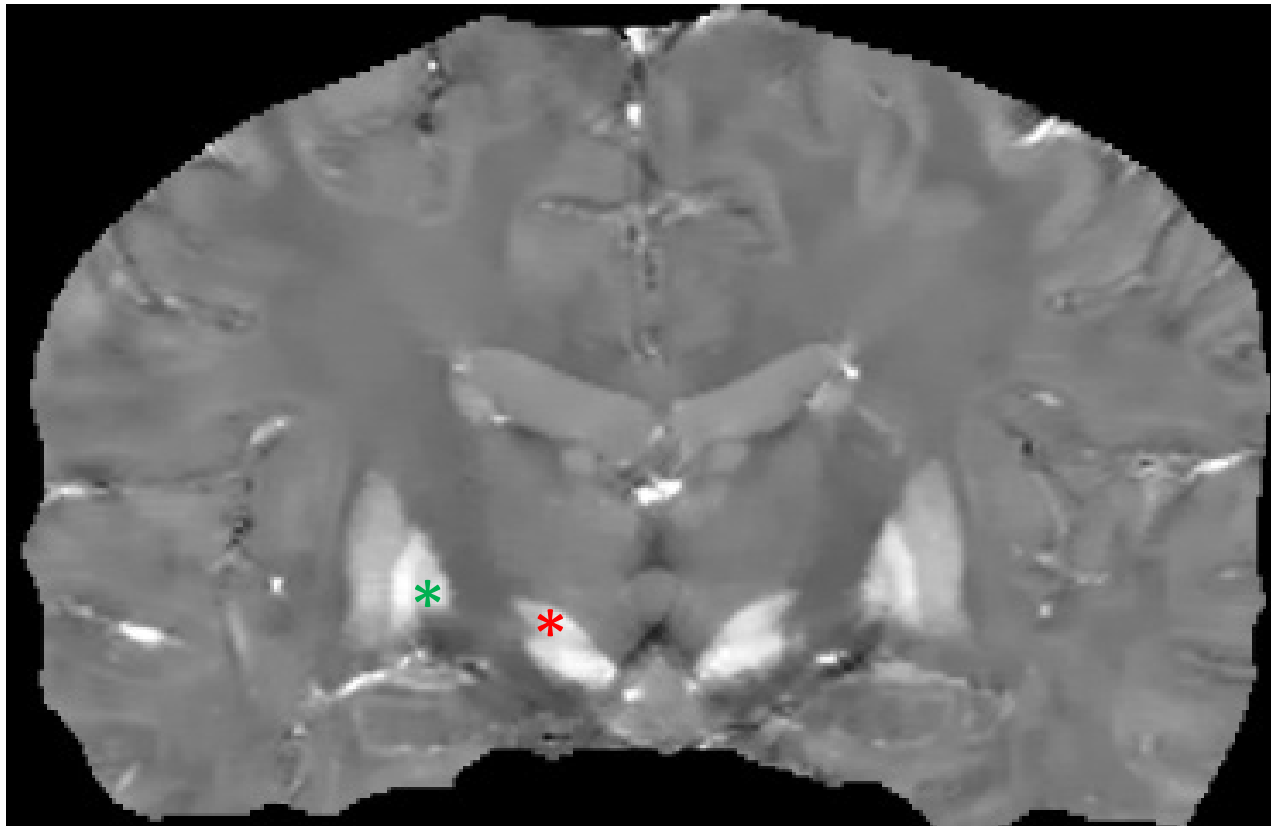


Rechargeable batteries



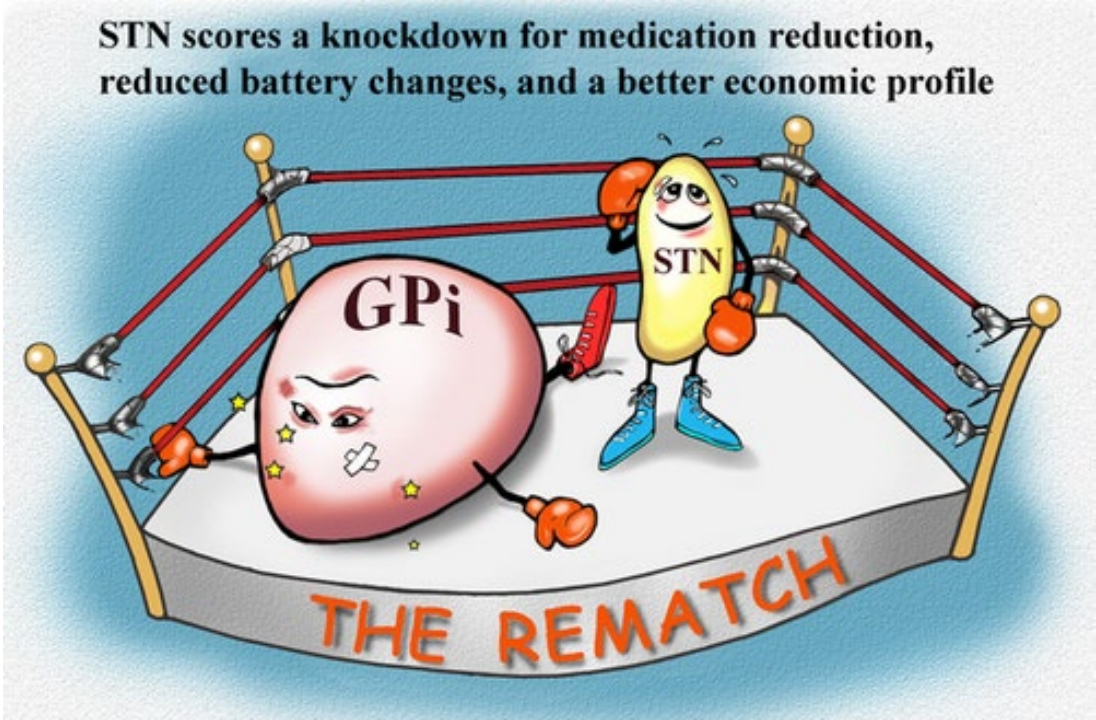
Targets

- Subthalamic nucleus
- Globus pallidus interna



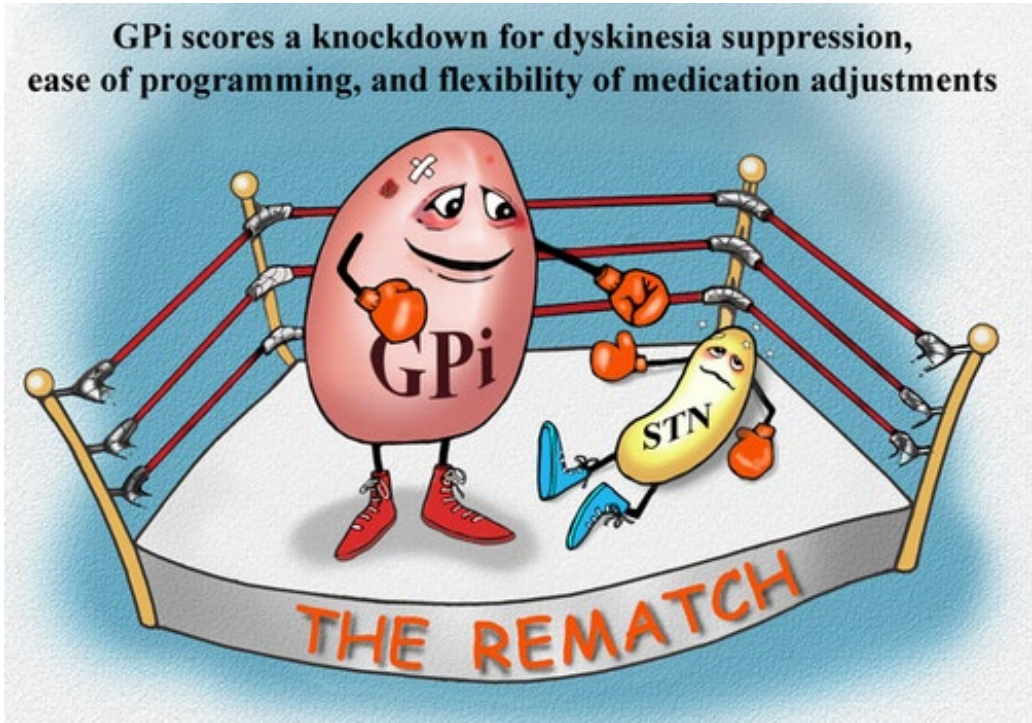
Targets: STN

- Medication reduction…
- Faster tremor control…



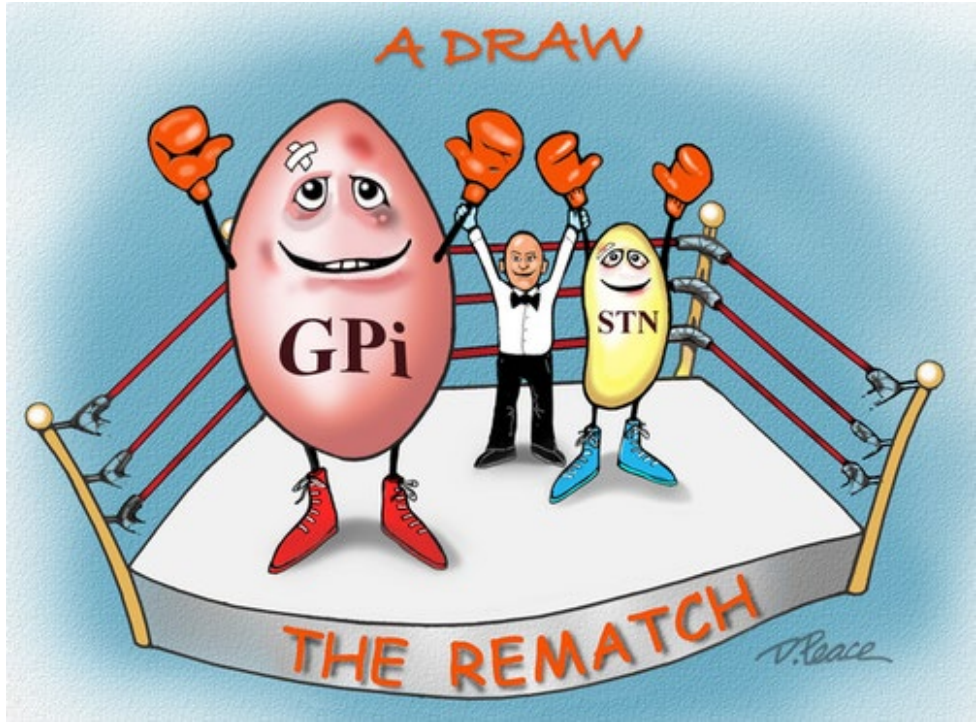
Targets: GPi

- Dyskinesias…
- Dystonia…
- Easy programming and flexible med adjustments



Targets: GPi and STN

- Both targets equivalent in overall motor benefit
- Team expert with both targets
- Personalize based on patient needs!



Imaging at UNMC

- MRI under general anesthesia
- At least 2 weeks before procedure

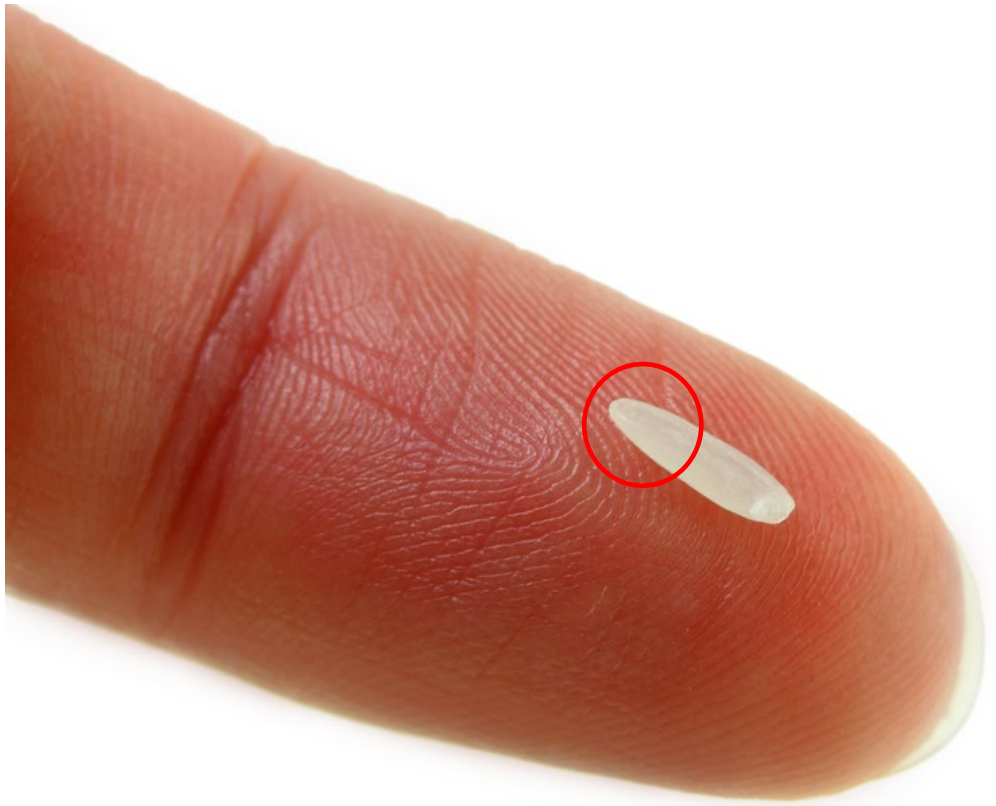
Imaging at UNMC

Imaging at UNMC

Surgery

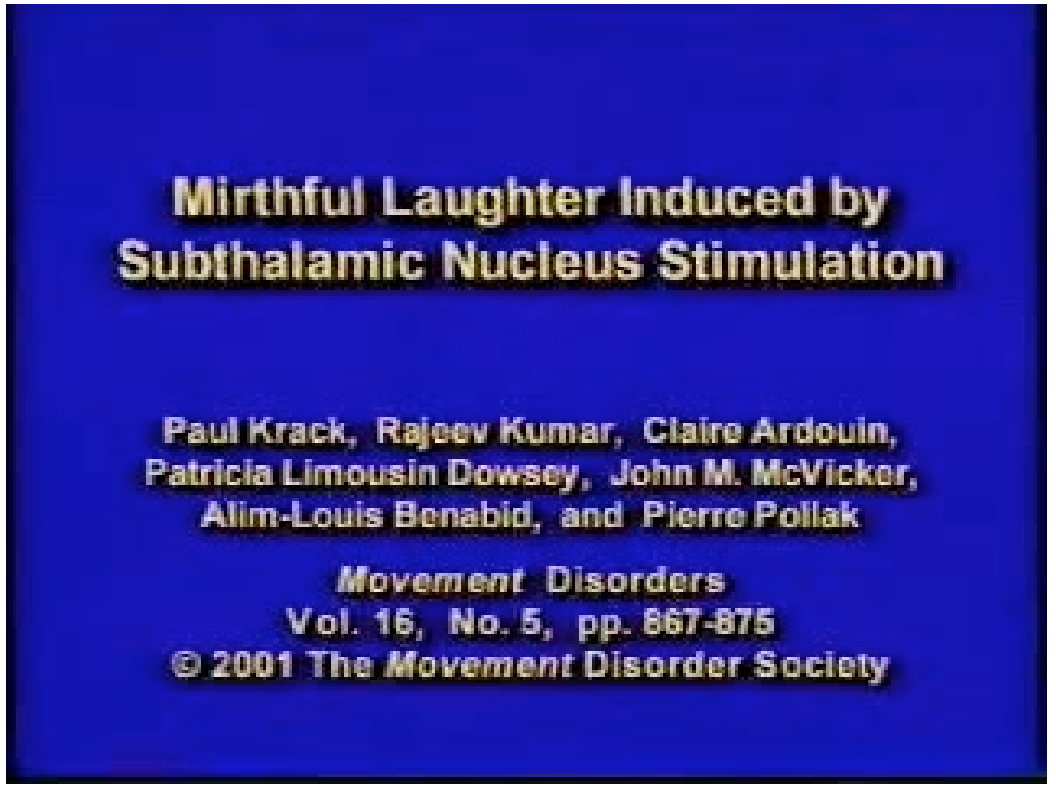
Sleep vs Awake Surgery

Planning: Targeting



Millimeters matter!

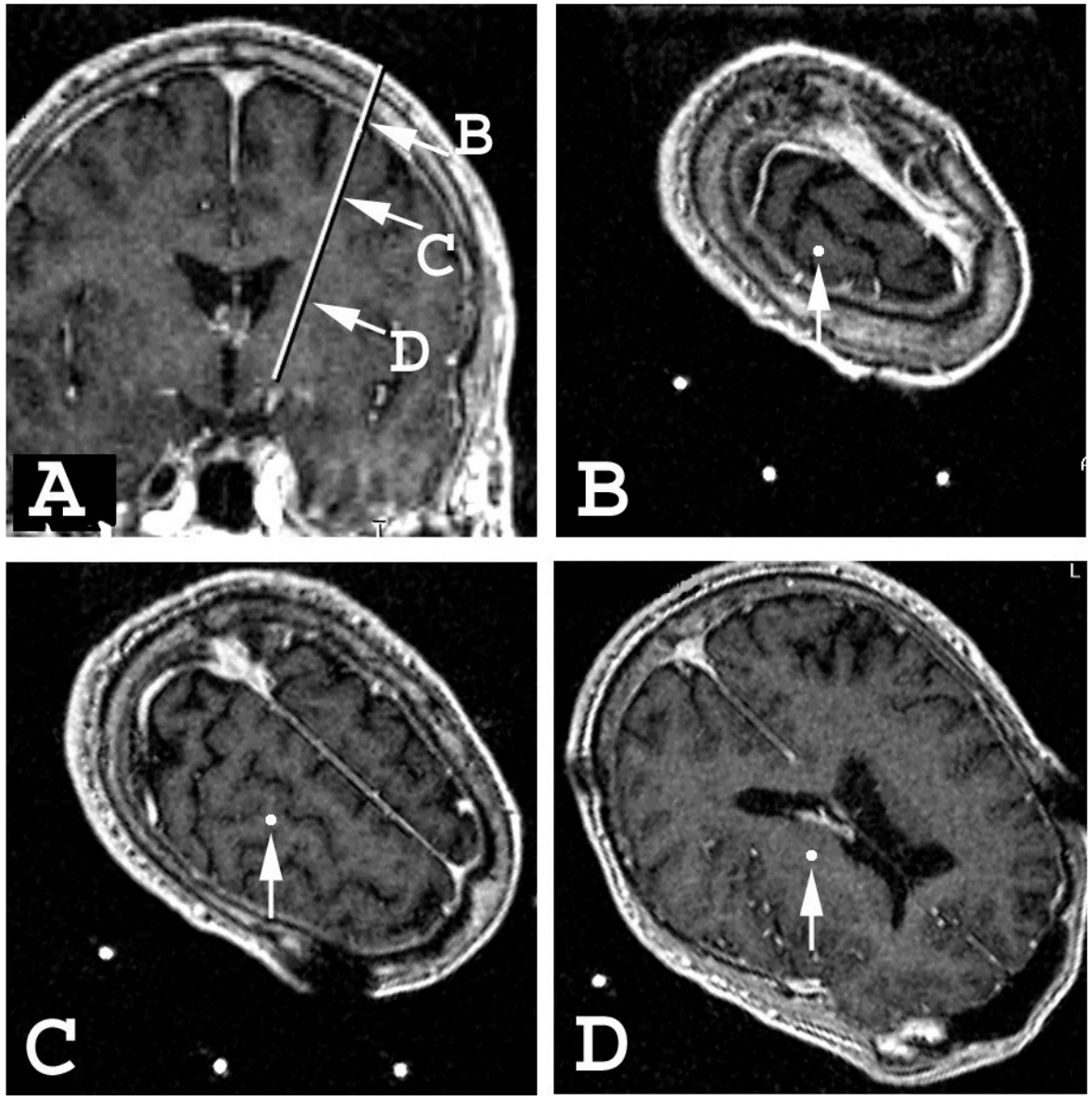
Millimeters matter!

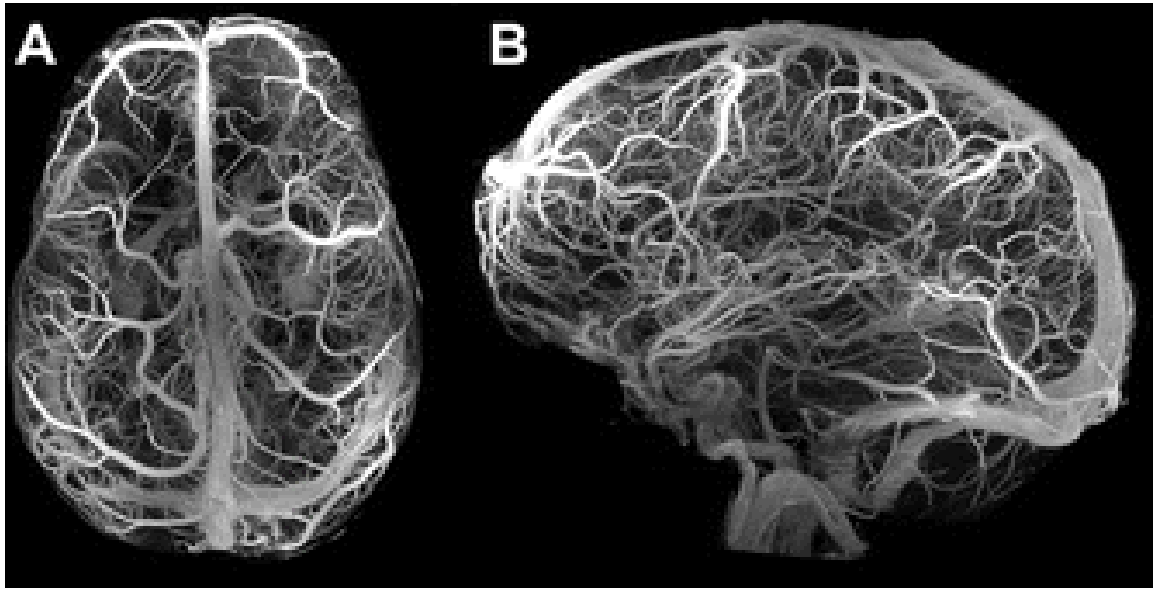


Mirthful Laughter Induced by Subthalamic Nucleus Stimulation

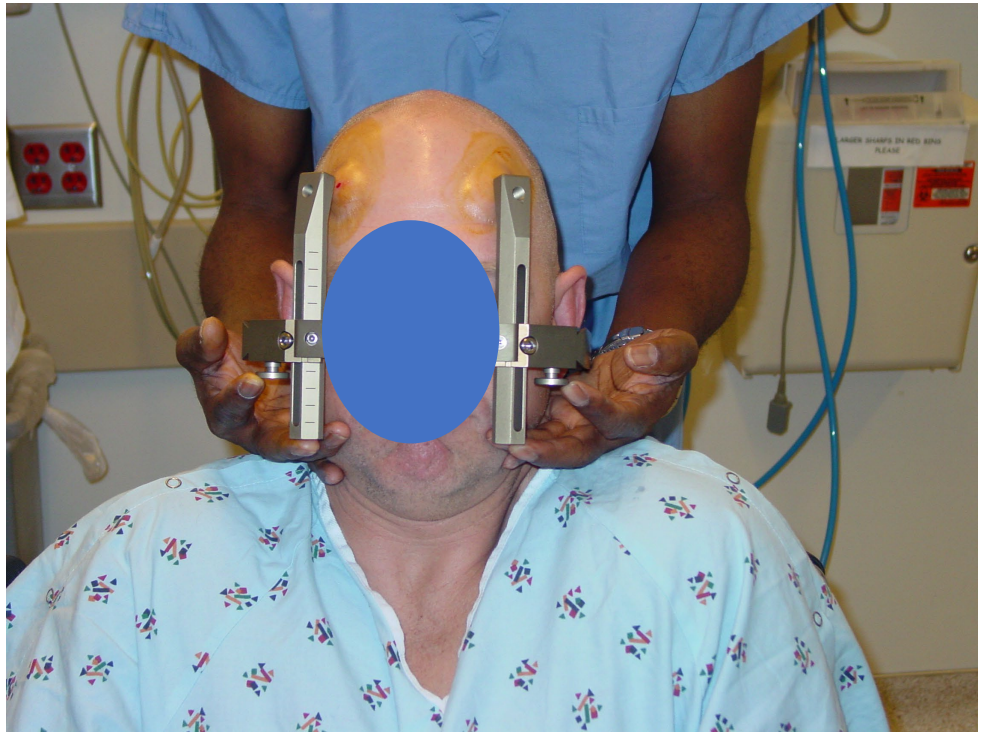
Paul Krack, MD,[1,2*] Rajeev Kumar, MD,[3] Claire Ardouin, PhD,[1] Patricia Limousin Dowsey, MD, PhD,[1,4]
John M. McVicker, MD,[3] Alim-Louis Benabid, MD, PhD,[1] and Pierre Pollak, MD[1]

Planning: Vessels





Procedure: Frame placement



Procedure: Frame placement

Procedure: Set up

Procedure: Set up

Asleep-Awake-Asleep Surgery

- Patient will be sedated for skin incision and burr hole placement

Procedure: Asleep

Asleep-Awake-Asleep Surgery

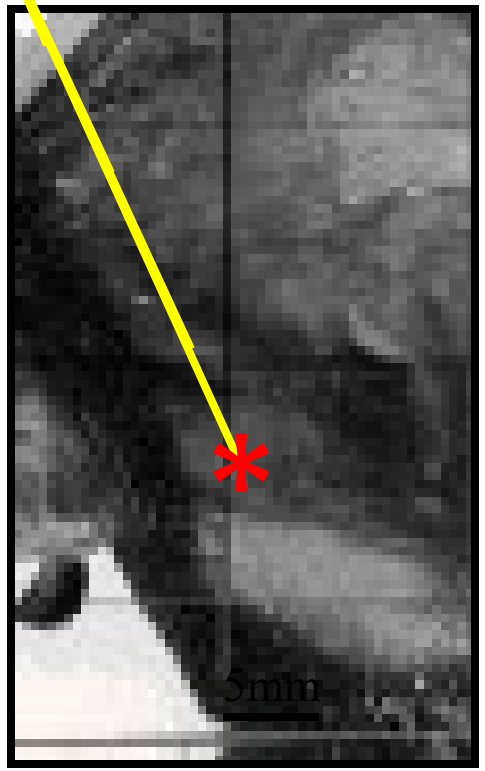
- Patient will be sedated for skin incision and burr hole placement
- Patient will be awakened for brain mapping and electrode insertion

Asleep-Awake-Asleep Surgery

- Patient will be sedated for skin incision and burr hole placement
- Patient will be awakened for brain mapping and electrode insertion
  - Motor symptoms does NOT manifest in the sleeping state

Procedure: Recordings

Position of electrode

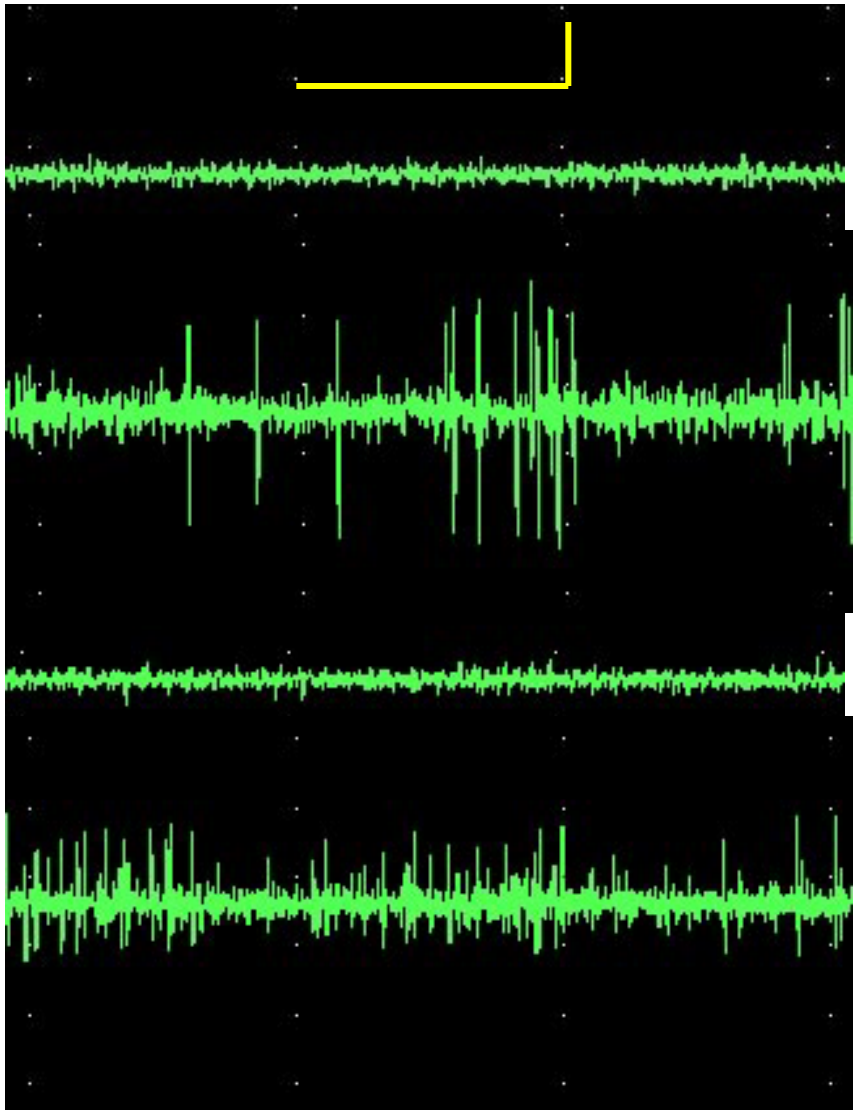


White matter

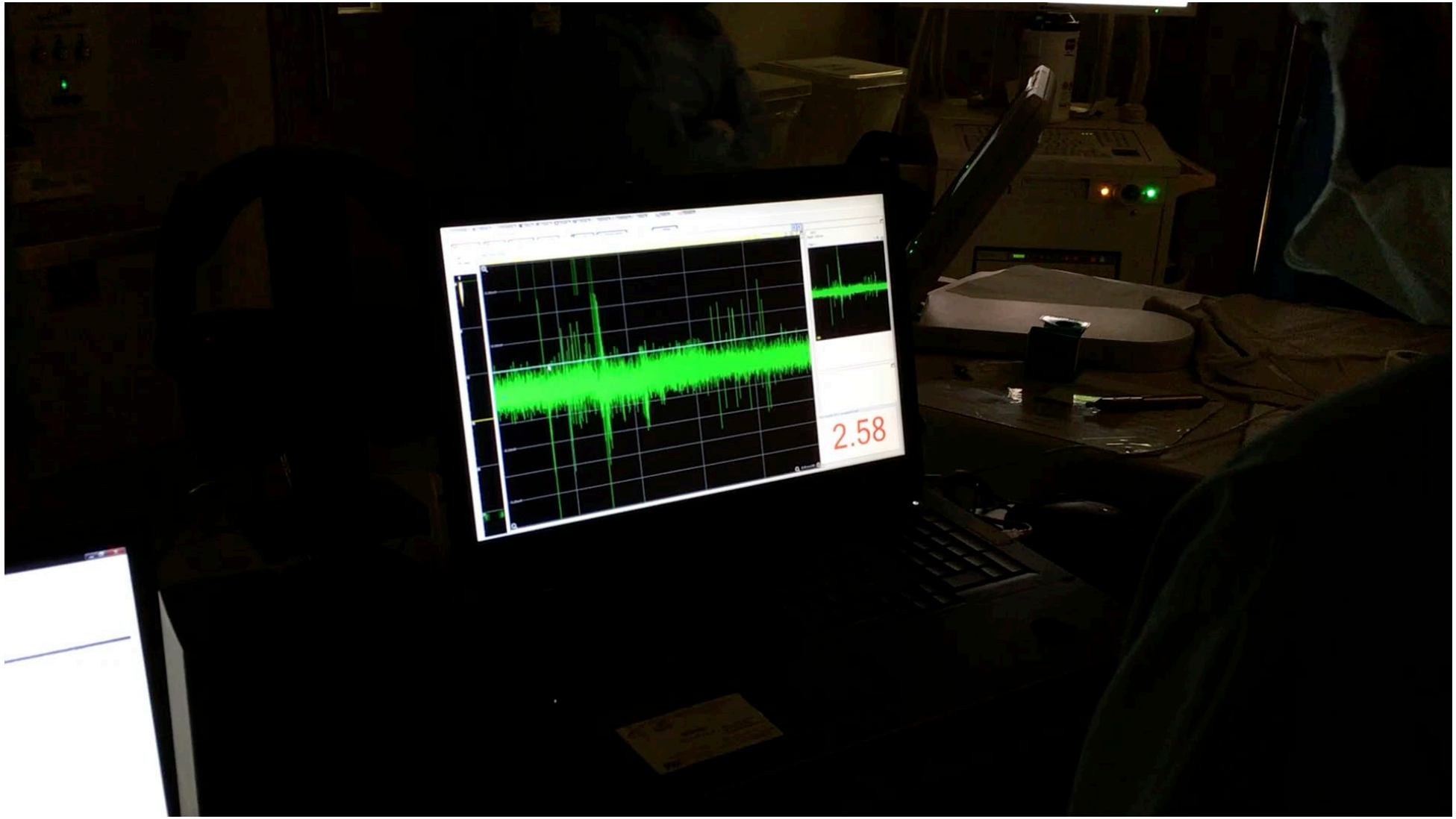
Thalamus

Zona incerta

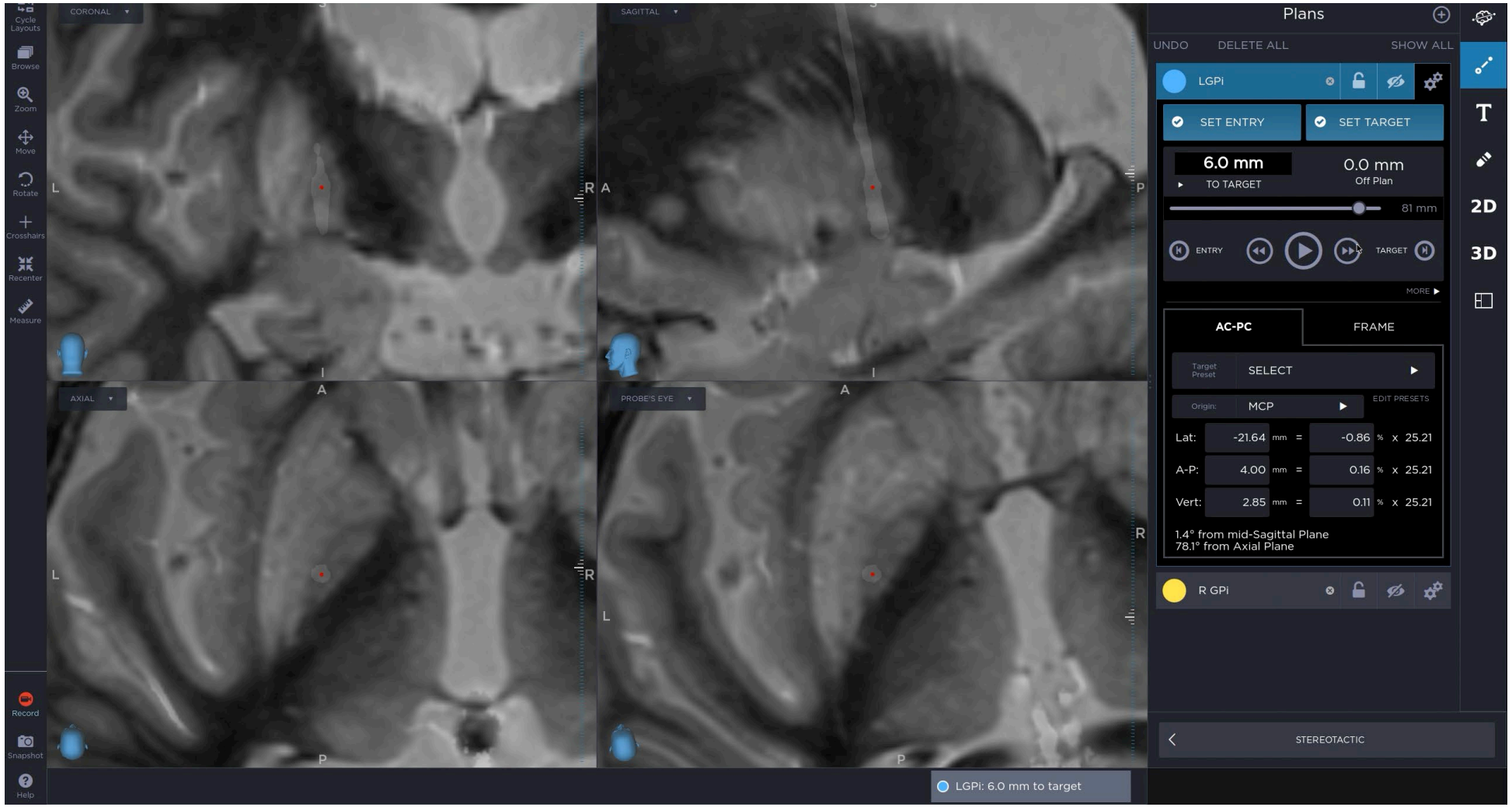
STN



Procedure: Recordings



Procedure: Imaging Confirmation



Procedure: Clinical testing

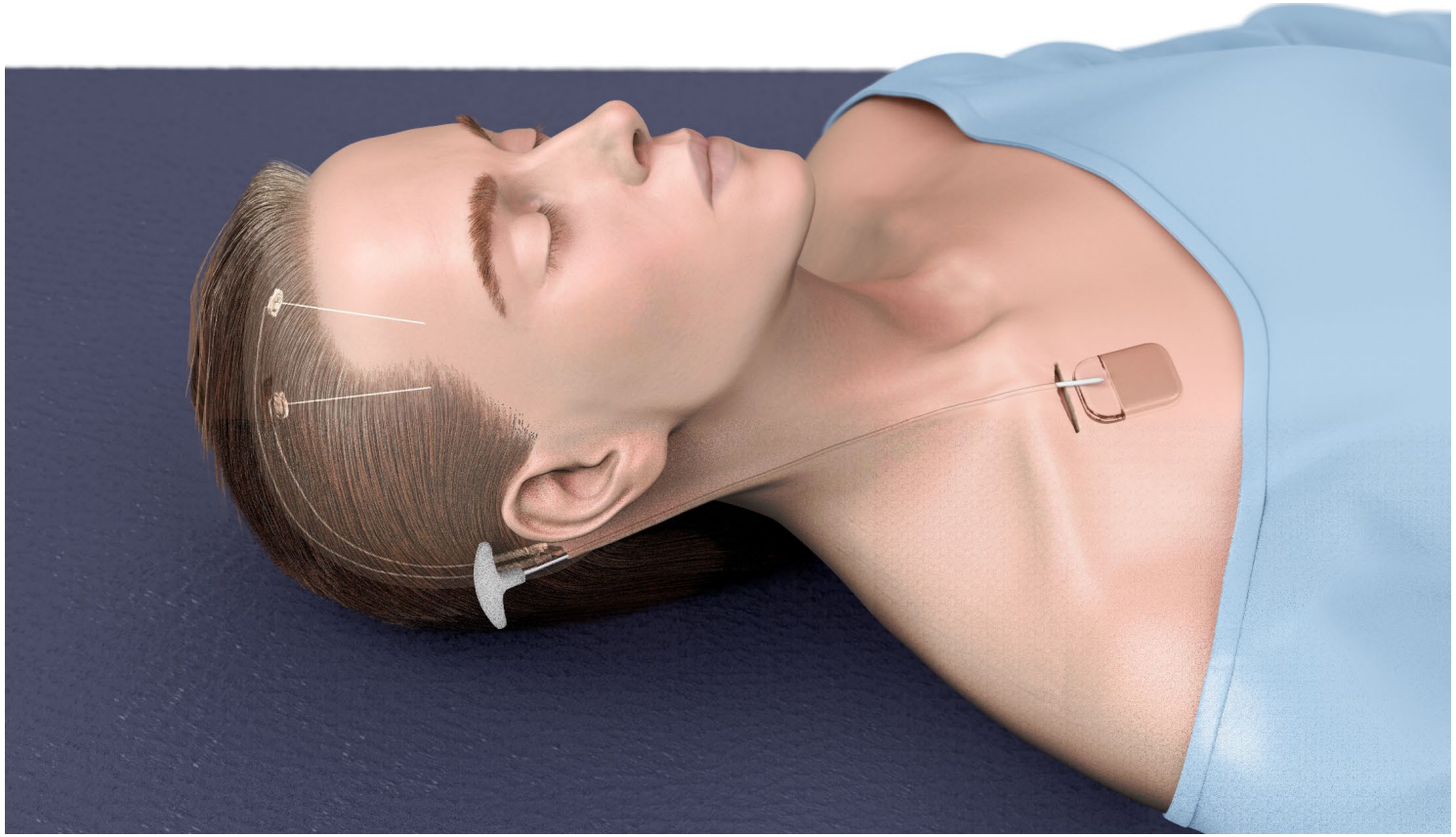
- Clinical benefit at low current: 0.5 mA
- Side effects at high voltages: > 4 mA
- Wider therapeutic window

Procedure: Clinical testing

Asleep-Awake-Asleep Surgery

- Patient will be sedated for skin incision and burr hole placement
- Patient will be awakened for brain mapping and electrode insertion
  - Motor symptoms does NOT manifest in the sleeping state
- Patient will go back to sleep for closure

Procedure: generator placement



Complications

- Hemorrhage: 3% Usually minor, no symptoms
- Severe Hemorrhage: 1%

Complications

- Hemorrhage: 3% Usually minor, no symptoms
- Severe Hemorrhage: 1%
- Infection: 3 %. Leads vs IPG.. Management?

Complications

- Hemorrhage: 3% Usually minor, no symptoms
- Severe Hemorrhage: 1%
- Infection: 3 %. Leads vs IPG.. Management?
- Hardware related: 3%, including misplaced leads.. What to do?

After surgery

What is important after surgery?

- Parkinson's medication
  - DBS is not ON
- Early ambulation
  - Speeds up recovery
  - Discharge next day after surgery

What is important after surgery?

- Communication Communication Communication

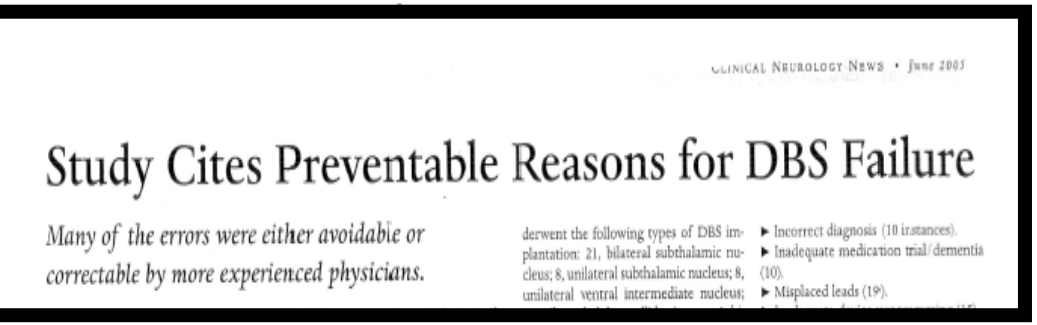
- Check your incisions!

What is happens after surgery?

- Precise Programming
  - Movement Disorder Neurologist
  - Advanced practice provider
  - Nurses

  - Time and patience!

- Medication and stimulation adjustments



CLINICAL NEUROLOGY NEWS • June 2005

Study Cites Preventable Reasons for DBS Failure

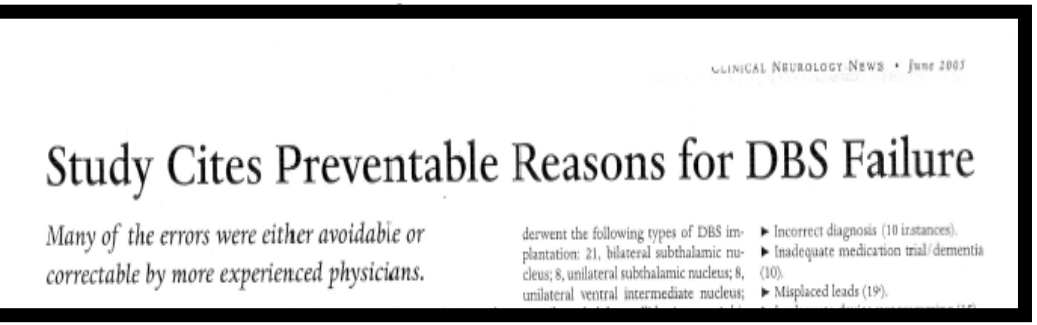
Many of the errors were either avoidable or correctable by more experienced physicians.

derwent the following types of DBS implantation: 21, bilateral subthalamic nucleus; 8, unilateral subthalamic nucleus; 8, unilateral ventral intermediate nucleus;

- Incorrect diagnosis (10 instances).
- Inadequate medication trial/dementia (10).
- Misplaced leads (19).

Conclusions

- Experience counts: More experience > better outcomes
- Proper patient selection



CLINICAL NEUROLOGY NEWS • June 2005

Study Cites Preventable Reasons for DBS Failure

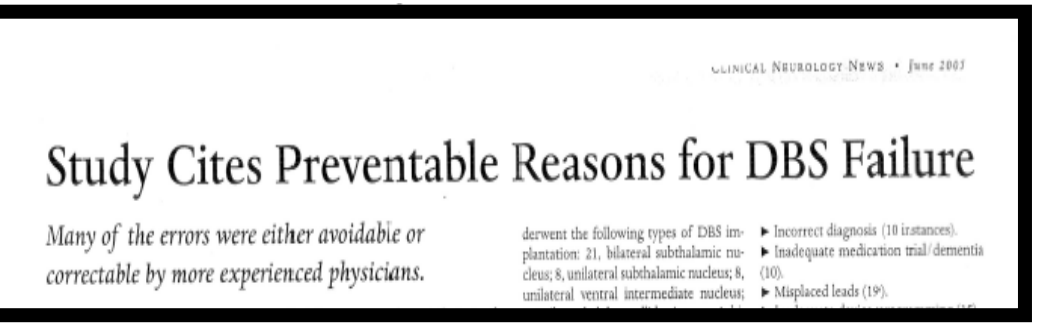
Many of the errors were either avoidable or correctable by more experienced physicians.

derwent the following types of DBS implantation: 21, bilateral subthalamic nucleus; 8, unilateral subthalamic nucleus; 8, unilateral ventral intermediate nucleus;

- Incorrect diagnosis (10 instances).
- Inadequate medication trial/dementia (10).
- Misplaced leads (19).

Conclusions

- Experience counts: More experience > better outcomes
- Proper patient selection
- Minimize complications: Safe surgical technique



CLINICAL NEUROLOGY NEWS • June 2005

Study Cites Preventable Reasons for DBS Failure

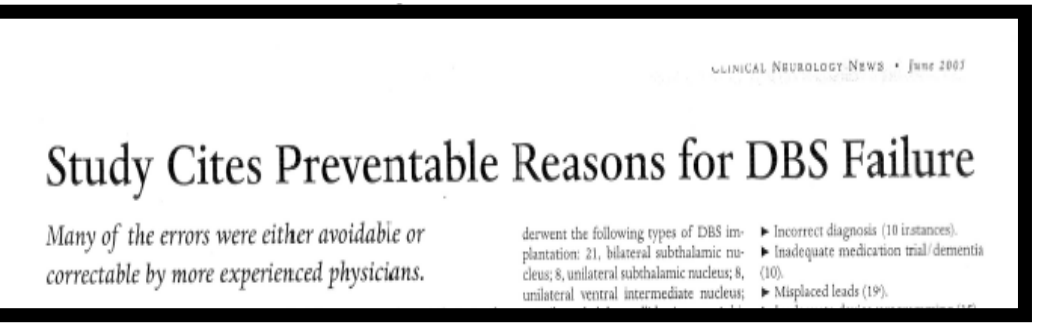
Many of the errors were either avoidable or correctable by more experienced physicians.

derwent the following types of DBS implantation: 21, bilateral subthalamic nucleus; 8, unilateral subthalamic nucleus; 8, unilateral ventral intermediate nucleus;

- Incorrect diagnosis (10 instances).
- Inadequate medication trial/dementia (10).
- Misplaced leads (19).

Conclusions

- Experience counts: More experience > better outcomes
- Proper patient selection
- Minimize complications: Safe surgical technique
- Maximize benefit: Accurate electrode placement



CLINICAL NEUROLOGY NEWS • June 2005

Study Cites Preventable Reasons for DBS Failure

Many of the errors were either avoidable or correctable by more experienced physicians.

derwent the following types of DBS implantation: 21, bilateral subthalamic nucleus; 8, unilateral subthalamic nucleus; 8, unilateral ventral intermediate nucleus;

- Incorrect diagnosis (10 instances).
- Inadequate medication trial/dementia (10).
- Misplaced leads (19).

Conclusions

- Experience counts: More experience > better outcomes
- Proper patient selection
- Minimize complications: Safe surgical technique
- Maximize benefit: Accurate electrode placement
- Personalization of therapy based on your goals!