When to Consider Surgery for Parkinson’s Disease and Tremor

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Surgery for Parkinson's Disease

- When to consider surgery
  - Drugs wearing off
  - Drugs side-effect (dyskinesias)
  - Drugs ineffective (tremor)
  - Early surgery
Available Surgical Procedures: Lesions

- **Pallidotomy**, Thalamotomy, Gamma Knife, Focused Ultrasound (MFUSO):
  - Can be effective for some PD symptoms
  - Some can be non-invasive
  - Involve targeted damage to brain tissue
  - Bilateral procedures are unsafe
  - Not reversible or adjustable
HIFU Lesioning
Not FDA approved
Lengthy procedure
Best results similar to lesion by other means
Unilateral only
Early failures
HIFU lesioning

No incision
Pre-lesion testing is possible
Trials for ET and PD tremor completed / ongoing
Trial for dyskinesia starting in Asia
Quicker result than radiosurgery
Available Surgical Procedures: Stimulation

Deep Brain Stimulation

- Involve surgical incisions
- Very effective in multiple modern studies
- Reversible and adjustable
- Safe for bilateral procedures
Deep Brain Stimulation (DBS)
STN Stimulation for PD
Surgery for Parkinsons

- Not a cure
- Surgery benefits MOTOR symptoms most:
  - Improve Tremor,
  - Lessen Rigidity
  - Improve Slowness
  - Lessen Dysknesia
  - Lower medication requirements
Surgery for Parkinsons

- Surgery does not usually help:
  - Memory
  - Imbalance
  - Voice
  - Drooling
When to Consider Surgery

- Drugs wearing off quickly
- Drug side effects (dyskinesia)
- Tremor-dominant parkinsons
- Not enough “ON” time
Activa DBS smoothes out motor function throughout the day.

Dyskinesia

“On” time

“Off” time

This graph is only an illustration; it is not built to scale.
STN Stimulation for PD

Base Line

- "On" without dyskinesia (27%)
- "Off" (49%)
- "On" with dyskinesia (23%)

6 Months

- "On" without dyskinesia (74%)
- "Off" (19%)
- "On" with dyskinesia (7%)
Long Term Results

![Graph showing ADL Score (%)]

- Before Surgery
- 1 Year after Surgery
- 3 Year after Surgery
- 5 Year after Surgery

- Off medication
- On medication
Activa DBS Benefits Proven to Last More Than 5 Years

New Advances in DBS Surgery

- New lead design = better stimulation
- Asleep surgery for some patients
Intra-op imaging for Asleep DBS
Greater Lead Coverage

- Trials ongoing in Europe (including 4X16 lead)
- Directional 1X4 lead being developed for U.S.
- Arrays of multiple parallel leads on the horizon
Directional electrodes
When to Consider Surgery

- Early to “spare” medical options?
Results from Surgery


- 96 patients underwent bilateral STN electrode implantation
STN Stimulation for PD

- At 3 months: 49% improvement in motor scores
STN Stimulation for PD

Results – The Deep-Brain Stimulation for Parkinson’s Disease Study Group – NEJM, 2001

At 6 months, the amount of time during the day patients had good mobility without dyskinesias was 74% compared to 27% pre-op
STN Stimulation for PD

Results – The Deep-Brain Stimulation for Parkinson’s Disease Study Group – NEJM, 2001

- Levodopa drug doses decreased 63%
DBS Surgery - Outcomes

- Weaver et al. JAMA 2009
- 250 patients studied over 6 months
- Surgery (120) compared to medical treatment (135)
- Surgery improved “on –time” by 4.5 hours per day
- Motor function improvement 71 % vs 34%
- Study included patients over 70 years old (30%)
Long Term Results: New England Journal of Medicine 2003

54% improvement in motor scores, 49% improvement in ADLs while off meds at 5 yrs
Dyskinesias improved in on-med state at 5 yrs
Long-term Results: DBS Surgery

- Quality-of-life scales studied over 24 months
- Mobility, stigma, bodily discomfort
- Improvement at 12 and 24-months after surgery
- Strongest quality-of-life correlation was to improvement in bradykinesia (slow movement)
  - (Lyons and Pahwa 2005)