The Surgical Management of Parkinson’s Disease

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I will discuss:
• The history of surgery for movement disorders
• Details of the current surgical procedure (deep brain stimulation),
  – Step-by-step description
  – Risks

Dr. Marjama will discuss:
• Who are good candidates for the surgery?
• What are the results of the surgery?
• …and more, I’d expect!

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Historical Aspects

Target: → Pyramidal → Basal ganglia
Technique: → Open → Stereotactic → Lesioning → Stimulation
  → Ventriculogram/atlas → CT/MRI computer planning
  → Microelectrode rec
Historical Aspects


Target: Pyramidal Basal ganglia
Technique: Open Stereotactic Lesioning Stimulation

Ventriculogram/atlas CT/MRI computer planning Microelectrode rec

• Pyramidal era – 1940’s
• Tremor relief at the expense of strength
Historical Aspects

• Basal ganglia and thalamic era – 1950’s
• Cooper’s “surgical accident” - 1952

• Basal ganglia and thalamic era – 1950’s
• Meyer’s “pallidoansotomy” - 1952

• Basal ganglia and thalamic era – 1950’s
• Relief of tremor, rigidity, bradykinesia without weakness
**Historical Aspects**

- Development of stereotactic techniques to make surgery less invasive
  - Horsley and Clarke – animal device (1908)
  - Spiegel and Wycis – human frame (1946)

- Stereotactic atlases

- Pneumoencephalography

- Development of stereotactic techniques
  - Lars Leksell
    - Target centered frame
    - Ventral posterior pallidotomy
Historical Aspects

- Development of stereotactic techniques
  - Lars Leksell
  - Target centered frame
  - Ventral posterior pallidotomy

- Surgical procedures virtually abandoned in 1968 when L-Dopa became available

- Re-discovery of Leksell’s ventral posterior pallidotomy
- Significant improvement in bradykinesia, rigidity, dyskinesia

- Re-birth of interest in 1990’s (Laitenen)
Deep Brain Stimulation

- **History**
  - Initially used for pain control in 1960s
  - Clinical trials for movement disorders in the 1990s
  - FDA approved for ET in 1997, PD in 2002

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Surgical Procedure Overview:

1. Frame placement
2. Imaging
3. Treatment planning
4. Operating room

Deep Brain Stimulation

- **History**
  - Initially used for pain control in 1960s
  - Clinical trials for movement disorders in the 1990s
  - FDA approved for ET in 1997, PD in 2002
- **Advantages over lesioning**
  - Adjustable
  - Reversible
  - Bilateral placement

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Surgical Procedure:

- Stereotactic frame placement (sedation with IV Versed, local anesthesia)
Surgical Procedure:

- Stereotactic frame placement (sedation with IV Versed, local anesthesia)

Surgical Procedure

- Imaging
  - MRI as outpatient without frame
  - CT morning of surgery with frame

Surgical Procedure

- Treatment planning:
  - MRI and CT image sets loaded onto graphic computer workstation in OR

Surgical Procedure

- Treatment planning:
  - Images registered to fiducial markers allowing precise translation of brain anatomy into frame coordinates

Surgical Procedure

- Treatment planning:
  - Targets (right and left STN) chosen based on “indirect” and “direct” techniques

Surgical Procedure

- Treatment planning:
  - Frontal entry points chosen and optimized to avoid cortical vessels, sulci, ventricles
Surgical Procedure

• Operating room:
  – Positioning, preparation
  – Arterial line, foley catheter

• Operating room:
  – Frame coordinates set to entry and target

• Operating room:
  – DBS lead securing device placed in burr hole

• Operating room:
  – Entry burr hole (nickel size) created

• Operating room:
  – Microelectrode recording
Surgical Procedure

• Operating room:
  – Microelectrode recording

Surgical Procedure

• Operating room:
  – Microelectrode recording

STN

Border/S

10sec

10sec

10sec

80ms

80ms

80ms

Sagittal Section Through the Thalamus

Surgical Procedure

• Operating room:
  – DBS implant, test stimulation

Surgical Procedure

• Operating room:
  – DBS implant, test stimulation

Before DBS

R DBS test stim

Surgical Procedure

• Operating room:
  – IPG implant 3 weeks later under general anesthesia

Surgical Procedure

• Operating room:
  – IPG implant 3 weeks later under general anesthesia
  – Rehab admission
Thank You!