Stereotactic Technique

- Traditionally uses stereotactic head frame
- Allows precise positioning
- Modern stereotaxis based on MRI and CT
Head Frame Application
Frameless: Advantages

- Patient comfort
- Patient mobility for evaluation
- Decoupling of imaging from surgery
- OR time savings up to several hours
Frameless DBS

- MRI imaging
- Fiducial Placement
- CT imaging
- Planning
- Surgery
  - Registration / Aiming
  - Microelectrode Recording
  - DBS Electrode Placement
Imaging

- MRI obtained without markers to minimize distortion
- CT obtained with markers for optimum accuracy
- CT/MRI image fusion to allow best of both imaging modalities to be utilized
Fiducial Placement

• 5 small skull screws
• Less discomfort than frame
CT/MRI Image Fusion
NeXframe Tower
Microdrive / Recording
Microrecording

- Tungsten or platinum-iridium electrode
- 1-10 micron tip
- Objectives:
  - Identify brain cells – differing firing patterns
  - Identify STN – very characteristic
  - Search for cells driven by joint movement – optimal target
Movement-Related Cells

Stimulator Placement
Pulse Generator Placement

• Usually performed as staged procedure
• Generator placed 1-2 weeks after lead implant
• Activated 4 weeks after lead implant
• Allows for resolution of inflammation and tissue reaction
Pulse Generator Placement
Current Generation
DBS Systems
Boston Scientific

- 15 year battery life
- ~10 minutes per day recharge
- Battery can last up to 3 weeks if unable to charge
- “Zero volt” technology
- Individual current sources
- Steerable stimulation
- Wider range of parameters
- MRI conditional at 1.5T
The Vercise™ Charging System is designed for patient comfort and ease of use.

The Charger is wireless, allowing patients to be active while charging.

The Charging Collar is lightweight, adjustable, and available in two sizes.
Medtronic

- Improved battery life compared to Activa PC
- Smaller and thinner than Activa PC
- Non-rechargeable
- Sensing capability
- Future ability to do closed-loop stimulation
- Wider range of parameters
- MRI conditional up to 3T
DBS Outcomes
Results - Parkinson's
Complications

• Hemorrhage - 1.5%
• Infection - 3-5%
• Stimulation side effects - common
  • Tingling, muscle contractions, double vision, speech difficulties
  • Can be mitigated by reprogramming
Common DBS Recovery Issues

- Fatigue
- Confusion
- Headache
- Impatience with programming
- Rehab, or not?
Conclusions

• STN DBS can improve all cardinal signs and symptoms of PD

• Refinements in technique:
  • Improved targeting
  • Improved patient comfort
  • Improved outcomes

• Current generation DBS systems add exciting new capabilities

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