It's a New Day! It's a New Beginning: Deep Brain Stimulation brings Patients with Parkinson's Disease Back to Their Life

Phuong Nguyen BSN, RN, CNOR, Karen Holcomb, BSN, RN, CNOR, Mikee Andres, BSN, RN

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Abstract

The National Institutes of Health (NIH) is known for its clinical research studies (protocols), innovations, and treatments for rare diseases. In 2010, the neurosurgeon, Dr. Kareem Zaghloul, initiated the Deep Brain Stimulation (DBS) protocol to aid patients with Parkinson's Disease (PD), Essential Tremor, and Primary Dystonia. During the DBS procedure, Dr. Zaghloul is assisted by the perioperative staff and this poster provides an in depth description of the nursing care throughout the DBS procedure.

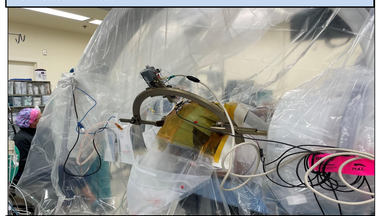
PD robs an individual of their normal motor functions so that one loses the ability to carry out activities of daily living (ADL). The DBS protocol was implemented to help patients with neurological dysfunction regain their ability to conduct and perform normal ADL. DBS electrically stimulates specified areas of the brain that regulate electrical signals in the neural circuits that control movement. The stimulation blocks the abnormal nerve signals that cause neurological dysfunctions and alleviates the abnormal motor symptoms. DBS is often administered to patients when their symptoms are not adequately controlled with medications.

DBS consists of three components: the lead, the extension, and the battery-operated medical device known as the implantable pulse generator (IPG). The lead, or electrode (a sterile insulated wire), is inserted through a small opening in the skull and implanted in the brain. The tip of the electrode is positioned within the specific targeted area pre-surgically identified by the neurosurgeon. The extension is an insulated wire that connects the lead to the IPG and passes under the skin of the head through the neck and shoulder. The IPG is implanted under the skin below the clavicle. Once the system is integrated, electrical impulses are sent from the IPG through the extension wire to the lead.

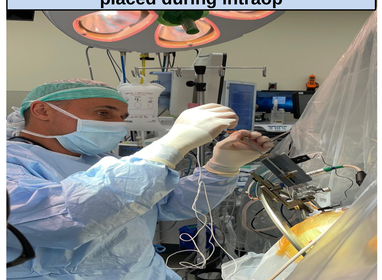
Throughout the DBS procedure, the perioperative Clinical Research Nurse is extremely instrumental and must flawlessly execute many functions, including but not limited to, preoperative and operating room setup of the special equipment used in the procedure, double and triple checking the availability of the implants expended, reassuring the conscious patient during the DBS process, coordinating the OR room during the electrical stimulation and assisting the neurosurgeon in all other phases.

The DBS protocol is a shining success that has allowed numerous patients to regain the ability to conduct activities of daily living and lead productive lives. After undergoing DBS treatments, the majority of patients experience a considerable reduction in their motor symptoms and can reduce their medications. In particular, DBS treatments improve many of the involuntary movements of the hands, arms, and head that are associated with PD, Essential Tremor, and Dystonia. The success of DBS has now motivated its use for treating other neurological diseases.

Dr. Zaghloul places the Leksell Head Frame in preop before the patient (Mr. Rua-Valdivia, M.) is taken to CT



Leksell Stereotactic System ("LSS") placed during intraop



Dr. Zaghloul preparing the LSS during stage 1 testing

Surgical Logistics

1. Preparation:
   - All implants for surgery are confirmed and verified by the neurosurgical resource nurse.
   - The patient undergoes magnetic resonance imaging (MRI) or computed tomography (CT) before the surgery. Thereafter, the scans from the MRI or CT are loaded into the Stealth.
   - The neurosurgeon utilizes the MRI and CT scans to identify and locate the specific target in the brain for surgical intervention; these areas are often the thalamus, subthalamic nucleus, and globus pallidus.
   - The neurosurgeon uses the Stealth navigation to aid in identifying the precise sites essential for implantation (also known as targets).
2. Perioperative care:
   - The OR staff set up the room with all DBS instrumentation for stage 1 and 2 and coordinate with the X-Ray department to have C-Arm in the room.
   - In preop, the patient is given a local injection at the pin sites where the Leksell Stereotactic System ("LSS") will be initially placed.
   - The patient is then taken to CT to verify the placement of the LSS.
   - After scanning the patient, images from the CT are uploaded immediately to the Stealth navigation.
   - The patient is taken to the operating room and placed under MAC sedation.
3. Stage 1 of DBS:
   - The surgeon creates two burr holes with the use of the LSS, where the temporary microelectrodes are placed into the target areas in the brain.
   - Neurologists perform microelectrode recording and testing stimulations to confirm the accuracy of the locations where the permanent DBS leads will be implanted while keeping patients alert by asking a series of questions and computerized adaptive tests.
   - The permanent DBS leads are then inserted in their ideal positions once the optimal brain targets have been selected.
   - C-arm is used intraoperatively to evaluate the precision of the permanent lead placements.
   - Throughout the surgery, the anesthesiologist and the circulator assesses the patient's needs and intervene as needed to relieve discomfort and pain.
   - Following testing, the electrodes are secured in place and the burr holes are temporarily closed.
4. Stage 2 of DBS:
   - After removing the LSS, the patient is placed on a donut head positioner and will subsequently be anesthetized under general anesthesia.
   - The IPG will be connected to the electrodes that were implanted from stage 1 and tested for impedance before it gets implanted into the chest.
5. Postoperative care:
   - The patient is taken to CT right after extubation to verify the accuracy of electrode placement and is thereafter transported to ICU.
   - Patient will recover in the ICU for 24 hours before getting transferred to a neurosurgical nursing floor.

Mr. Scott, J. playing the guitar during stage 1 testing

Dr. Zaghloul and his research team, neurologists, and anesthesia team during stage 1 testing

Dr. Zaghloul and Scrub Nurse, Phuong Nguyen handling testing cables during surgery

Surgical Considerations and Interventions

1. Postop infection:
   - Intraoperative antibiotics are highly recommended.
   - Thorough skin prepping before incision.
   - Antibiotics are administered promptly before skin incision.
   - Antibiotic irrigation is utilized during surgery.
2. Patient outburst emotion and dyskinesia:
   - OR nurse and staff must be attentive and provide continuous emotional support for the patient throughout the perioperative process.
   - OR nurse and staff need to make sure the patient receives adequate pain control and the correct anesthesia agent to relieve dyskinesia symptoms.
   - OR nurse and staff provide lemon swabs or ice sponges as needed by the patient during the testing phase to prevent mouth dryness.
   - OR nurse and staff need to frequently assess the patient's level of comfort and intervene as needed.
3. Intraoperative and postoperative Bleeding:
   - Neurosurgeons must carefully identify the target brain areas for electrode placement and the blood vessels that may interfere with the insertion target.
   - The patient must have an immediate postop CT scan to verify the electrode placement and any potential hematoma.
   - The circulator and scrub nurse prepare hemostatic agents to be used in event of bleeding.
4. Pain Management:
   - The patient must be adequately evaluated and medicated for pain throughout the perioperative period.

Acknowledgments

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