

Parkinson's Disease

Overview

- Parkinson's disease (PD) is a complex, progressive and degenerative neurological disorder that causes loss of control over body movements.
- PD results from cell death in an area of the brain known as the substantia nigra. Because these cells are involved in the production of dopamine, a chemical that enables communication among the brain cells involved in motor control, their death results in the motor control symptoms associated with the disease.
- Eighty percent of dopamine-producing cells are lost before the motor symptoms of Parkinson's disease even appear. (National Parkinson Foundation)
- There is currently no cure for PD. Medications can be used to improve motor function; they may, however, lose their effectiveness over time. Additionally, as PD progresses, the medication levels required for motor function control may cause intolerable side effects.

Primary Symptoms:

- Tremor – Involuntary, rhythmic shaking of a limb, head or entire body
- Rigidity – Stiffness or inflexibility of the limbs or joints
- Bradykinesia/Akinesia – Slowness of movement/Absence of movement
- Postural Instability – Impaired balance and coordination

Key Statistics

According to the National Parkinson Foundation:

- PD afflicts an estimated 1.5 million Americans.
- It affects both men and women in almost equal numbers.
- In the United States, it is estimated that 60,000 new PD cases are diagnosed each year.
- PD typically develops after the age of 65.
- "Young-onset" PD affects an estimated 15% of people under age 50.

According to the Parkinson's Disease Foundation:

- The combined direct and indirect cost of Parkinson's, including treatment, social security payments and lost income from inability to work, is estimated to be nearly \$25 billion per year in the United States alone.
- Medication costs for an individual patient average \$2,500 a year
- Therapeutic surgery can cost up to \$100,000 dollars per patient.

National Parkinson Foundation – www.parkinson.org/netcommunity
Parkinson's Disease Foundation -- www.pdf.org/publications/factsheets

Impact on Quality of Life

- As Parkinson's progresses, it becomes increasingly disabling, making routine daily activities like bathing, dressing or eating without assistance from others difficult or impossible.
- Patients can experience extreme swings in movement control — from periods of virtually normal motor function to episodes of complete immobility — in the span of a few hours.
- The disabling effects of Parkinson's disease and the unpredictable onset of side effects from treatment with the drug levodopa may cause many patients to become unwilling or unable to venture outside their homes to work, shop, eat or socialize — everyday activities that most people take for granted.
- The inability of some advanced Parkinson's patients to care for themselves often leads to a loss of dignity and self-esteem.
- In advanced Parkinson's disease, some patients become wheelchair-bound or bedridden.

Distinct from Essential Tremor

- While tremor is the most recognized symptom of Parkinson's disease, it is rarely the most disabling symptom because the tremor generally occurs when the affected limb is at rest.
- One way to help confirm a Parkinson's diagnosis and rule out essential tremor is by evaluating a patient's response to the drug levodopa.

Treatment Options

- **Drug TherapyDopaminergic** – a class of drugs with dopamine-like action; used to treat all symptoms of Parkinson's disease except postural instability. Includes the drug levodopa.
- **Decarboxylase inhibitor** – a drug that is combined with levodopa to treat the symptoms of Parkinson's disease.
- **Dopamine agonists** – a class of drugs that binds to dopamine receptors and imitates the action of dopamine.
- **Anticholinergics** – a class of drugs that relaxes smooth muscle; used primarily to treat tremor in Parkinson's disease.
- **MAO-B inhibitors** – a class of drugs that block an enzyme that breaks down dopamine, allowing it to be at the receptor longer; used to treat all symptoms of Parkinson's disease.
- **COMT inhibitors** – a class of drugs that binds to dopamine receptors and imitates the action of dopamine.

(Note: The above drug information was taken from the Activa DBS Style Guide Glossary.)

Surgical Therapies

- Deep brain stimulation (Activa® Deep Brain Stimulation Therapy)
 - Activa DBS ranks as the most significant and innovative advancement in the treatment of PD since the introduction of the drug levodopa 40 years ago.
 - In a *New England Journal of Medicine* study, Activa DBS was shown to increase periods of good mobility (no symptoms or involuntary excessive movements) from 27% to 74% of a patient's waking day.¹ In another important study, Activa DBS maintained motor symptom improvements even after five years.²
 - An implantable medical device, similar to a cardiac pacemaker, is used to deliver electrical stimulation to precisely targeted area deep in the brain to treat symptoms.
 - Stimulation is adjustable, and its effects are reversible.
- Pallidotomy – lesioning (surgical destruction) of specific cells of the brain's globus pallidus
 - Lesioning is irreversible.
 - Benefits and side effects cannot be adjusted.
 - The procedure cannot be performed bilaterally without the risk of serious consequences and/or permanent side effects such as loss of speech.
- Brain tissue and cell implants – currently considered experimental.

References:

- 1 The Deep Brain Stimulation for Parkinson's Disease Study Group. Deep brain stimulation of the subthalamic nucleus or the pars interna of the globus pallidus in Parkinson's disease. *N Engl J Med.* September 2001;345(13):956-963.
- 2 Krack P, Batir A, Van Blercom N, et al. Five-year follow-up of bilateral stimulation of subthalamic nucleus in advanced Parkinson's disease. *N Engl J Med.* November 2003;349(20):1925-1933.

Parkinson's Disease

Primary Symptoms

Tremor – Involuntary, rhythmic shaking of a limb, head, or entire body

- Tremor is the most recognized symptom of Parkinson's disease (PD) and often starts with an occasional tremor in one finger that eventually spreads to the whole arm.
- Tremor is present when the limb is at rest or held up in an unsupported position; it disappears briefly during movement.
- The tremor may affect only one part or side of the body, especially in the early stages of the disease.
- Not everyone with PD has tremor.

Rigidity – Stiffness or inflexibility of the limbs or joints

- The muscle rigidity experienced in PD often begins in the legs and neck.
- Rigidity or resistance to movement affects most patients.
- The muscles become tense and contracted, and some patients may feel pain or stiffness.

Bradykinesia/Akinesia – Slowness of movement/Absence of movement

- Slowness of movement or bradykinesia is one of the classic symptoms of PD.
- Over time, a person with PD may develop a stooped posture and a slow, shuffling walk.
- They eventually also may lose their ability to start and keep moving.
- Their gait – the way they walk — can be erratic and unsteady and cause them to fall.
- After a number of years, their muscles may not move at all. This is called akinesia or freezing.

Postural Instability – Impaired balance and coordination

- A person with postural instability may have a stooped position: the head is bowed and the shoulders drooped.
- They may develop a forward or backward lean.
- Some people with postural instability have many falls that cause injuries.
- People with a backward lean have a tendency to step backwards, which is known as retropulsion.

Activa® Deep Brain Stimulation Therapy for Parkinson's Disease

Overview

Activa® Deep Brain Stimulation (DBS) Therapy from Medtronic safely and effectively manages some of the most disabling motor symptoms of Parkinson's disease.

Activa DBS ranks as the most significant and innovative advancement in the treatment of PD since the introduction of the drug levodopa 40 years ago.

In a *New England Journal of Medicine* study, Activa DBS was shown to increase periods of good mobility (no symptoms or involuntary excessive movements) from 27% to 74% of a patient's waking day.¹ In another important study, Activa DBS maintained motor symptom improvements even after five years.²

Activa DBS is the only adjustable, reversible, non-destructive, non-drug treatment for motor symptoms of movement disorders that offers patients greater freedom to live and work. It can have a profound effect on the lives of people with PD by improving their motor control. It can also improve the lives of their caregivers by reducing the burden posed by their loved one's disorder and resulting disability.

Symptoms Treated

The symptoms that Activa DBS has been shown to reduce include:

- Rigidity – stiffness or inflexibility of the limbs or joints
- Bradykinesia/akinesia – slowness of movement/absence of movement
- Tremor – involuntary, rhythmic shaking of a limb, the head, or the entire body

References:

- 1 The Deep Brain Stimulation for Parkinson's Disease Study Group. Deep brain stimulation of the subthalamic nucleus or the pars interna of the globus pallidus in Parkinson's disease. *N Engl J Med.* September 2001;345(13):956-963.
- 2 Krack P, Batir A, Van Blercom N, et al. Five-year follow-up of bilateral stimulation of subthalamic nucleus in advanced Parkinson's disease. *N Engl J Med.* November 2003;349(20):1925-1933.

The Activa DBS System

Also known as deep brain stimulation, Activa DBS uses a surgically implanted medical device, similar to a cardiac pacemaker, to deliver carefully controlled electrical pulses to precisely targeted areas of the brain involved in motor control and muscle function. Electrical stimulation of these areas normalizes the brain circuits that control movements. The stimulation can be programmed and adjusted non-invasively (without surgery) by a trained clinician to maximize symptom control and minimize side effects.

The Activa System consists of several implanted and external components. The implanted components of the Activa System include:

- **DBS™ Lead** – A DBS lead is a thin, insulated wire with four electrodes at the tip that is implanted in the brain; the electrodes are positioned in the target site for stimulation.
- **Neurostimulator** -- A neurostimulator is a small, sealed device that contains a battery and electronics; it is implanted beneath the skin in the chest and produces the electrical pulses emitted through one or more of the electrodes.
- **Extension** – Like the lead, an extension is a thin, insulated wire; passed under the skin of the head and neck, it connects to the lead at the top of the skull and to the neurostimulator in the chest.

Procedure and Follow-Up

- The surgery to implant the device takes several hours and is divided into two parts: the procedure to implant the lead(s); and the procedure to implant the neurostimulator(s) and extension(s). The duration of each procedure and the specific steps involved vary by patient and neurosurgeon. Some neurosurgeons complete both procedures during a single surgery; others complete each procedure in separate surgeries.
- As with any surgery, there are risks associated with the procedures to implant the Activa System device. The main risks are intracranial hemorrhage during lead placement and infection at the site of the neurostimulator. These adverse events vary in seriousness and can usually be resolved without permanent consequences.
- Depending on the condition and the location of symptoms, the stimulation may be applied to one or both sides of the brain. (The right side of the brain controls the left side of the body, and vice versa.) Bilateral stimulation requires two leads and two extensions – one set for each side of the brain – but can be delivered with one or two neurostimulators: the Soletra neurostimulator can be connected to only one extension; the Kinetra neurostimulator can be connected to two extensions. For patients requiring bilateral stimulation, the choice between one or two neurostimulators is influenced by patient and physician preference.
- Activa DBS requires the involvement of a multidisciplinary team of clinicians, usually including one or more neurologists, a neurosurgeon, and a

neurophysiologist. A neurologist is involved in advising patients with Parkinson's disease about their treatment options and identifying those who might benefit from Activa DBS. Supported by a neurologist and sometimes a neurophysiologist, a specially trained neurosurgeon performs the procedures to implant the device. After surgery, a neurologist or another clinician is involved in programming and adjusting the stimulation parameters to maximize symptom control and minimize side effects. Programmable stimulation parameters include: frequency, amplitude, and pulse width.

- Patients receiving Activa DBS can use a handheld device to turn the stimulator on or off.
- The neurostimulator's battery life varies depending on usage, stimulation settings, and power requirements. When the battery runs low, the neurostimulator can be replaced in a simple surgical procedure; the extension and lead are typically not replaced.

Parkinson's Disease Resources

Patient Advocacy

American Parkinson Disease Association (APDA)

Provides information on support groups, treatment options, and health-care facilities across the United States.

National Office

135 Parkinson Avenue
Staten Island, NY 10305
Phone: (800) 223-2732 or (718) 981-8001
Fax: (718) 981-4399
Email: apda@apdaparkinson.org
Web site: www.parkinsonapda.org

West Coast Office

10850 Wilshire Blvd., Suite 730
Los Angeles, CA 90024-4319
Phone: (800) 908-2732 or (310) 474-5391
Fax: (310) 474-0292
Email: apdawc@earthlink.net

National Parkinson Foundation

Offers extensive treatment information and news about Parkinson's for patients and caregivers.

1501 N.W. 9th Avenue / Bob Hope Road
Miami, Florida 33136-1494
Phone: (305) 243-6666
Toll Free National: (800) 327-4545
Fax: (305) 243-5595
Email: contact@parkinson.org
Web site: www.parkinson.org

For media inquiries, please contact Christie Lowey at rbb public relations - (305) 448-2930 or christie.lowey@rbbpr.com.

The Parkinson Alliance

Raises funds, largely through partnerships and matching fund affiliations, for research into the causes of and potential cures for Parkinson's.

P.O. Box 308
Kingston, NJ 08528
Phone: (609) 688-0870 or (800) 579-8440
Fax: (609) 688-0875
Web site: www.parkinsonalliance.org

Parkinson's Action Network (PAN)

An advocacy-oriented nonprofit that seeks to increase awareness about Parkinson's and to educate policy makers as to the importance of federal research funding on the disease, among other goals.

1025 Vermont Ave. N.W., Suite 1120
Washington, DC 20005
Phone: (800) 850-4726 or (202) 638-4101
Fax: (202) 638-7257
Email: info@parkinsonsaction.org
Web site: www.parkinsonsaction.org

Parkinson's Disease Foundation (PDF)

Promotes and helps fund research into the causes of and cure for Parkinson's and for better treatment of symptoms.

1359 Broadway Street, Suite 1508
New York, NY 10018
Phone: (800) 457-6676 or (212) 923-4700
Fax: (212) 923-4778
Email: info@pdf.org
Web site: www.pdf.org

*Descriptions provided by the Michael J. Fox Foundation

Professional Associations

American Academy of Neurology

An international professional association of more than 20,000 neurologists and neuroscience professionals dedicated to providing the best possible care for patients with neurological disorders.

1080 Montreal Avenue
Saint Paul, MN 55113
Phone: (800) 879-1960 or (651) 695-2717
Fax: (651) 695-2791
Email: memberservices@aan.com
Web site: www.aan.com

The Movement Disorders Society (MDS)

An international professional society of clinicians, scientists, and other healthcare professionals focusing on movement disorders, including Parkinson's disease.

555 East Wells Street, Suite 1100
Milwaukee, WI 53202-3823 USA
Phone: (414) 276-2145
FAX: (414) 276-3349
Email: info@movementdisorders.org
Web site: www.movementdisorders.org