

**Today You Will Learn**

**ACTIVA®**  
Deep Brain Stimulation

- Facts about Parkinson's disease (PD)
- Historical overview of treatments for Motor Symptoms
- Role of Medtronic Deep Brain Stimulation

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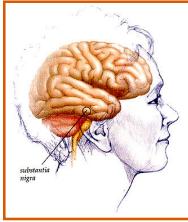
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**Facts About PD**

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**What is Parkinson's disease?**

An illness of the brain that gets worse over time and leads to problems with movement. The cause is not known.



The common pathology is a gradual degeneration of dopamine production and the dopamine pathway.

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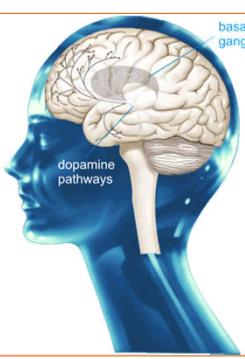
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To coordinate movement, Dopamine is a key neurotransmitter used to connect the motor cortex and the basal ganglia via the Dopamine Pathway

PD symptoms are not typically diagnosed until 80-90% of the dopamine-producing cells have degenerated.

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**Facts About PD**ACTIVA®  
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- **Tremor** (shaking)
- **Rigidity** (muscle stiffness)
- **Akinesia/bradykinesia** (lack of movement or slowness)
- **Postural instability** (poor balance)

**Historical Therapies**ACTIVA®  
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- In the 1950's, surgical interventions began to target the basal ganglia
- In the early 1960's, surgeons developed techniques to create lesions using alcohol, freezing, and electrosurgery
- In the late 1960's, Levodopa was discovered as a way to increase the level of dopamine in the brain
- Initially, doses were high and side effects were significant
- With the addition of Carbidopa, doses were reduced and the medication became the gold standard
- By the mid-1970's, patients began to exhibit motor fluctuations

**Facts About PD**ACTIVA®  
Deep Brain Stimulation**Motor Fluctuations:**

- Wearing off of medication effects
- Sudden or unpredictable swings from good to poor movement control
- Half of the people with Parkinson's disease develop motor fluctuations after 5 to 9 years of levodopa treatment\*

\*Source: Lang AE, Lozano AM. Parkinson's disease. Second of two parts. *N Engl J Med.* 1998;339:1130-1142.



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**Facts About PD**

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**Dyskinesia: Excessive Involuntary Movements**

- Often occur when levels of dopamine are too high
- Can also occur as dose wears off
- More than 4 out of 10 people with Parkinson's disease suffer from dyskinesia after 5 to 9 years of levodopa treatment\*

\*Source: Miyawaki E, Lyons K, Pahwa R, et al. Motor complications of chronic levodopa therapy in Parkinson's disease. *Clin Neuropharmacol.* 1997;20:523-530.

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When Life Depends on Medical Technology

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**Medtronic Activa DBS**

**Instrument of Change**

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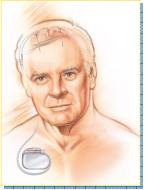
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**Today's Treatments**

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**Activa DBS:**

- One of the fastest growing treatments for Parkinson's disease in the world today  
(Over **115,000** DBS systems implanted)
- Surgically implanted medical device, much like a pacemaker, that delivers electrical stimulation to very specific areas in the brain
- Proven to improve motor function in Parkinson's disease patients



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When Life Depends on Medical Technology

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- One or 2 leads are implanted to deliver electrical stimulation to the motor center of the brain
- The leads are then connected to extensions that connect the leads to a neurostimulator implanted in the chest

All of the implanted components are under the skin and are relatively unnoticeable

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**ACTIVA®**  
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**Benefits of DBS**

**1. DBS Therapy improves quality of life.**

QUALITY OF LIFE

AT 6 MONTHS

**20% DBS**

**0% BMT**

Source: 1. Medtronic. DBS Therapy for Parkinson's Disease and Essential Tremor. Clinical Summary 2013.

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**Benefits of DBS**

**2. DBS Therapy improves activities of daily living.**

ACTIVITIES OF DAILY LIVING

AT 6 MONTHS

Treatment	Improvement in Activities of Daily Living (%)
DBS	28%
BMT	0%

1. Medtronic. DBS Therapy for Parkinson's Disease and Essential Tremor. Clinical Summary 2013.

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**Benefits of DBS**

**ACTIVA® Deep Brain Stimulation**

**3. DBS Therapy provides 5 additional hours of 'on' time without dyskinesia each day.**

**MOTOR FUNCTION**

**AT 6 MONTHS**

**'On' Time**

DBS	BMT
5.2 HRS	0 HRS BMT

**Source:**  
1. Medtronic DBS Therapy for Parkinson's Disease and Essential Tremor. Clinical Summary 2013.

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**Benefits of DBS**

**4. DBS Therapy significantly reduces medication use for treatment of PD.**

**DRUG-RELATED COMPLICATIONS\***

**AT 6 MONTHS**

Treatment	Change at 6 months
-DBS	-44%
-BMT	-8%

\*Medtronic. Medtronic DBS Therapy for Parkinson's Disease and Essential Tremor. Clinical Summary. 2013.

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## Pneumonic Device for Patients Considering DBS

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- Does not cure.
- Bilateral DBS is often required to improve gait, although sometimes unilateral DBS has a marked effect on walking.
- Smooths out "on/off" fluctuations.
- Improves tremor, stiffness (rigidity), bradykinesia, and dyskinesia in most cases but may not completely eliminate them.
- Never improves symptoms that are unresponsive to your best "on". For example, if gait or balance does not improve with best medication response, it is very unlikely to improve with surgery.
- Programming visits are likely to occur many times during the first 6 months and then follow-up visits as frequently as every 6 months. There will be multiple adjustments in the stimulation and the medication.
- Decreases medication in many, but not all, patients.

\*Sources: Rodriguez et al. "Patient Selection for Deep Brain Stimulation", The Neurologist, Vol 13, #5, Sept. 2007.



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**When is the current “Right Time” for DBS?**

- > 5 years of PD symptoms (helps determine idiopathic PD)
- Optimal medication therapy has been tried
- Motor symptoms are troubling despite medication (tremor, uncontrolled on-off episodes, disabling dyskinesia)
- No conditions that would preclude an elective surgery
- Cognitive decline is moderate
- Balance issues are not prominent



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**Steps Involved in Receiving DBS**

- Meet with an implant center neurologist and neurosurgeon for clinical evaluation
  - On/Off Medication assessment
  - Medical / Surgical history review
- If approved and you decide to proceed:
  - MRI Imaging the week before surgery
  - CT day-of or day-before surgery
  - Leads implanted during inpatient procedure
  - Battery and extensions implanted 1-2 weeks later during outpatient procedure





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**Risks Associated with DBS**

Procedure-related risks
Infection around the implanted device
Some paralysis or weakness of muscles; loss of strength or energy
Bleeding in the brain



99% of serious adverse events were resolved at 6 months with or without sequelae.



Source:  
1. Medtronic DBS Therapy for Parkinson's Disease and Essential Tremor. Clinical Summary 2013.

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