

# Activa Parkinson's Control Therapy

ELE 482 Biomedical Engineering Seminar III

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## What is Parkinson's disease?

Parkinson's disease, a movement disorder, is a progressive and degenerative neurological disease with four primary symptoms: rigidity (stiffness or inflexibility of the limbs and joints), bradykinesia/akinesia (slowness of movement/absence of movement), tremor (involuntary, regular, rhythmic shaking of a limb, the head, the mouth, the tongue, or the entire body), and postural instability (poor balance and coordination).

## What is Activa Parkinson's Control Therapy?

Activa Parkinson's Control Therapy from Medtronic, is a treatment that uses two surgically implanted medical devices, similar to cardiac pacemakers, to deliver electrical stimulation to precisely targeted areas on each side of the brain. Continuous stimulation of these areas blocks the signals that cause the disabling motor symptoms of the disease. As a result, many patients achieve greater control over their body movements.

## How does the therapy work?

Activa Parkinson's Control Therapy works by electrically stimulating targeted structures in the brain - the subthalamic nucleus (STN) or globus pallidus interna (GPi) - that control movement and muscle function. A lead with tiny electrodes is surgically implanted in the brain and connected by an extension that lies under the skin to a neurostimulator implanted near the collarbone. The electrical stimulation can be non-invasively adjusted to meet each patient's needs.

## What components are implanted in the patient?

**Lead** - The lead is a thin insulated coiled wire with four electrodes at the tip that is implanted in the brain.

**Extension** - The lead is connected to an extension, a thin, insulated coiled wire that is threaded under the skin from the head, down the neck and into the upper chest.

**Neurostimulator** - The extension is connected to a neurostimulator, a small, sealed device that contains a battery and electronics. The neurostimulator is implanted beneath the skin in the chest. It produces the electrical pulses needed for stimulation. These electrical pulses are delivered through the extension and through the lead to the globus pallidus or subthalamic nucleus in the brain.

## How is the Activa System implanted?

The neurosurgeon uses a imaging techniques such as magnetic resonance imaging (MRI) or computed tomography (CT) scanning to map the brain and localize the target. The lead is inserted through a small opening in the skull and implanted in the targeted site.

Before the lead implant procedure, the patient's scalp is anesthetized. The patient remains awake and alert surgeons can test the stimulation to maximize Parkinsonian symptom suppression and minimize side effects. To ensure proper placement of the lead, the patient must be alert.

If the patient's Parkinsonian symptoms are suppressed during this test stimulation, the neurostimulator and extension are implanted. First, the patient is given a general anesthetic or sedative. The extension is passed under the skin of the scalp, neck and shoulder to connect the lead to the neurostimulator. A small incision is made near the collarbone and the neurostimulator is implanted beneath the skin.