Stanford | MEDICINE

Stanford Movement Disorders Center

The ability to move our bodies as we please is something most of us take for granted. Yet, for some people, the brain and the body are no longer in sync. Simple movements become difficult and/or unwanted movements interrupt the normal repertoire.

Movement disorders occur when the circuitry within the sensorimotor network in the brain is not functioning correctly. With our aging population, it is expected that the prevalence of movement disorders in the United States will double by 2030. Still, with improved treatments and new research, there is reason to hope.

Movement disorders can be difficult to diagnose and require an in-depth evaluation by a movement disorders specialist.

The Stanford Movement Disorders Center provides comprehensive evaluations and care by a multispecialty team that works together to help maintain quality of life for people with movement disorders. Experts from neurosurgery, behavioral neurology, neuropsychology, sleep medicine, psychiatry, nuclear medicine, radiology, genetics, nursing, and pharmacy collaborate closely with our movement disorders neurologists to provide medical care that is both cutting edge and compassionate.

Parkinson's disease: Promising new methods for diagnosis and treatment

Parkinson's disease is a chronic neurological disorder and is the second most common neurodegenerative disease in America, after Alzheimer's disease.

There are many factors that may contribute to the development of Parkinson's disease such as genetics, injury, environmental toxins, a vascular or metabolic disorder, or certain medications. Increasing age is one of the strongest factors.

In the brain, nerve cells (neurons) normally secrete a chemical called dopamine that relays messages between certain parts of the brain, facilitating smooth, coordinated muscle movements. In Parkinson's disease, these cells become damaged and die off. Loss of dopamine causes the neurons to fire abnormally. This process of impairment—neurodegeneration—changes brain circuitry and leaves patients less able to control their movements.

AT THE STANFORD MOVEMENT DISORDERS CENTER, WE TREAT A WIDE RANGE OF NEUROLOGICAL DISEASES, INCLUDING:

- **Ataxia**
- **Chorea**
- **Corticobasal syndrome and other taupathies**
- **Dystonia**
- **Huntington's disease**
- **Lewy Body Dementia**
- **Myoclonus**
- **Parkinson's disease**
- **Tremor**
- **Vascular Parkinsonism**
- **Wilson's disease**

PARKINSON'S DISEASE BY THE NUMBERS

- **1 in 100 people over age 60**
- **More than 10 million people worldwide**
- **At least 1.5 million Americans**
- **Average age of onset is 60**
- **About 60,000 Americans diagnosed each year**
- **Men are 1.5 times more likely to have Parkinson's than women**

How is Parkinson's diagnosed?

According to the National Parkinson Foundation, early non-motor symptoms of Parkinson's disease can include loss of the sense of smell, sleep disorders, depression, and constipation, which may precede the motor features of the disease by several years. Unfortunately, there is currently no definitive test, or biomarker, yet for Parkinson's disease.

At Stanford, the disease is diagnosed by a comprehensive neurological evaluation by the Movement Disorders team. The Stanford Motor Control Laboratory has several quantitative tests of movement, gait, and balance that also help in the diagnosis and monitoring of patients. PET scans may also be used.

Current Treatment Options for Parkinson's Disease

Although there is no cure for Parkinson's disease, and no treatment has been definitively shown to stop or slow disease progression, researchers at Stanford are working to change that.

Medications
Some Parkinson's medications may increase dopamine release or may act like dopamine themselves, and others may act by slowing down the break-down of dopamine. Medication improves mobility, lessens rigidity, and may control tremor or shaking. However, medications for Parkinson's disease may be accompanied by adverse side effects, which can be as disabling as the underlying symptoms.

Chemodenervation – Botulinum toxin injections
Chemodenervation in Parkinson's disease is used to relieve muscle spasms (dystonia) and excess saliva (sialorrhea).

Neuromodulation – Deep Brain Stimulation
In carefully targeted nodes in the brain, high-frequency deep brain stimulation (DBS), which can be thought of as a brain pacemaker, modulates abnormal nerve signals as a way to reset brain activity. DBS improves motor signs and allows patients to reduce their medication, which results in fewer dyskinesias and an improved quality of life. DBS may not improve speech, cognition, or certain aspects of balance.

However, first-generation brain pacemakers are limited to "open-loop" electrical stimulation: they are active all the time, and cannot sense the brain signals they are modulating or receive feedback. Stanford researchers are testing an exciting next-generation DBS system that can sense brain signals, will only stimulate when needed, and will automatically adapt its stimulation parameters to a patient's specific symptoms and state of activity.

Exercise, rehabilitation, and sensorimotor retraining techniques
Research shows that exercise improves blood flow to the brain, promotes neural plasticity, stimulates growth factors, and increases the concentration of neurotransmitters. It has been shown to improve many aspects of Parkinson's disease and other neurodegenerative diseases. Sensorimotor training uses simple rehabilitation tools such as balance boards, foam pads, and elastic bands to emphasize postural control and addresses progressive challenges to improve motor performance.

Dance for Parkinson's Disease
Parkinson's patients who practice some form of dance see physical and psychological improvements: better balance, motor skills, freedom of movement, and endurance. Dance for PD™ guides participants in moving in creative ways and engages cognition in parts of the brain that are specifically affected by the disease. Supported by a grant from the National Parkinson Foundation, Dance for PD™ classes at Stanford are offered free of charge.

Promising Research at Stanford and Clinical Areas of Focus

The same doctors who care for patients at the Stanford Movement Disorders Center also contribute to innovative basic science, clinical, and translational research in Parkinson's disease and other movement disorders, all with an aim to improve quality of life for patients.

Helen Bronte-Stewart, MD, MSE, the John E. Cahill Family Professor of Neurology and director of the Stanford Movement Disorders Center, performs intraoperative microelectrode mapping during deep brain stimulation device placement. Her lab's mission is to understand the underlying neurophysiology contributing to abnormal movements in Parkinson's disease and other movement disorders. The Bronte-Stewart lab has the world's largest cohort of research subjects implanted with sensing neurostimulators and they are developing the first closed loop DBS systems in freely moving human subjects.

Kathleen Poston, MD, MS, associate professor of neurology, investigates dysfunctional brain networks and brain circuitry, using neuroimaging to improve diagnosis and treatment. Dr. Poston also leads clinical studies for Parkinson's disease and mild cognitive impairment. Her clinical expertise focuses on Parkinson's disease, dementia with Lewy Body, and atypical Parkinsonian disorders, with a special interest in the cognitive and non-motor symptoms in these disorders.

Melanie Lising, MD, clinical assistant professor of neurology and neurological sciences, researches DBS and neuromodulation for the treatment of Parkinson's disease, essential tremor, dystonia, and their clinical outcomes. She also investigates common non-motor symptoms and cognitive functioning in Parkinson's disease and their relevance to quality of life.

Katherine Mackenzie, MD, clinical assistant professor of neurology and neurological sciences, specializes in pediatric movement disorders and directs the Lucile Packard Children's Hospital Movement Disorders Clinic, focusing on disorders such as dystonia, chorea, tremor, ataxia, tics, and Tourette Syndrome.

Hokuto Morita, MD, clinical assistant professor of neurology and neurological sciences, has a special research interest in hereditary movement disorders, and provides clinical expertise in the treatment and diagnosis of Parkinson's disease, atypical Parkinsonism, Huntington's disease, ataxia, tremor, dystonia, and myoclonus.

Jennifer O'Malley, MD, PhD, clinical assistant professor of neurology and neurological sciences, specializes in pediatric movement disorders and neuromodulation. She evaluates and treats children with dystonia, and is working with other Stanford movement disorders faculty to develop a pediatric deep brain stimulation program.

Veronica Santini, MD, MA, clinical assistant professor of neurology and neurological sciences and co-director of the Huntington's Disease and Ataxia Clinic, specializes in diagnosing and managing Parkinson's disease and atypical Parkinsonism, Huntington's disease, dystonia, tic disorder, tremor, ataxia, and multiple system atrophy. Her research focuses on disorders of the autonomic nervous system.

Laurice Yang, MD, clinical assistant professor of neurology and neurological sciences, researches dystonia and spasticity and is trained in performing botulinum toxin injection under ultrasound guidance. Watching or imagining certain motor tasks can improve motor performance, and Dr. Yang's research involves using rehabilitation and sensorimotor retraining techniques to alleviate the symptoms of dystonia. Dr. Yang has developed an interdisciplinary clinic for Wilson's disease.

Pacific Udall Center of Excellence in Parkinson's Research

People with Parkinson's disease are at risk of developing memory and cognitive impairments, but the exact causes for this risk are not yet clear. To understand the genetic contributions to these memory problems, in July 2016 Stanford became the lead site for the Pacific Udall Center. Led by Thomas Montine, MD, PhD, chair of the Department of Pathology, the center is currently recruiting Parkinson's disease patients as part of an ongoing observational research study. Dr. Kathleen Poston, leader of the Clinical Core at the Udall Center, has recently showed that tiny strokes in addition to Parkinson's disease increase the risk of having problems with attention, memory, and the ability to plan and multitask.

Stanford's Clinical Trial Program

Our clinical researchers recruit patients and healthy control subjects for studies aimed at understanding symptoms as well as interventional clinical trials that investigate newly developed therapies, such as deep brain stimulation techniques.

Current clinical trials at Stanford include:

- Young Plasma Infusion Therapy for Parkinson's Disease
- Closed Loop Neuromodulation Approaches for Parkinson's Disease
- Neural and Kinematic Features of Freezing of Gait for Adaptive Neurostimulation
- Vibrotactile Coordinated Reset Neurostimulation in Parkinson's Disease
- Neurodegeneration and Brain Function in Aging with HIV and Parkinson's Disease
- The Pacific Udall Center Study for Genetics and Cognition in Parkinson's Disease
- The Healthy Brain Aging Study

Join Us

The diagnosis of Parkinson's disease or another movement disorder can be devastating—a new harsh reality that threatens to rip away independence, an occupation, and quality of life. At Stanford Medicine, we are working hard every day to alleviate the suffering caused by Parkinson's disease and other movement disorders. We invite you to please join our efforts and help to improve the prognosis and treatment options for these patients.

Contact Us

To find out more about how your philanthropy can make a difference in the lives of people suffering with Parkinson's disease and other movement disorders, please contact:

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