Unlocking the Secrets Of Parkinson Disease
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After completing this article, readers should be able to:

- Describe the signs and symptoms of Parkinson disease.
- Differentiate between Parkinson disease and parkinsonian syndromes.
- Describe the brain changes that cause Parkinson disease.
- Describe how clinicians currently diagnose Parkinson disease.
- Compare and contrast the medical imaging modalities used to diagnose Parkinson disease.
- Describe the role medical imaging plays in deep brain stimulation surgery for Parkinson disease.
- Discuss how medical imaging advances could change how clinicians diagnose Parkinson disease.

Parkinson disease (PD) is a progressively degenerative neurologic disease that robs people of their independence and dignity. Although most people associate shaking, stiffness, slow movements and altered gait with PD, the initial symptoms often are subtle and difficult to notice. One patient, a retired psychiatrist, recalls that nearly 10 years before his diagnosis, patients (usually children) would sometimes remark about his odd facial expression. Looking back, he now realizes this slight change in expressive affect was probably his first symptom (oral communication, July 2007).

Quality of life declines with the arrival of PD-related tremors, insomnia, digestive problems and psychological changes. People may become housebound and can no longer enjoy social and physical activities. Eventually they lose the ability to maintain balance and dress and feed themselves.

There is no cure for Parkinson disease. Medications help quiet tremors, lessen rigidity and improve gait and fluidity of movement, but they do not always relieve the patient’s symptoms throughout the day. Many PD patients experience fluctuating “on” and “off” periods.

“On” describes the patient’s optimal response to PD medication. During this time, patients experience less tremor and rigidity and can best perform daily activities. Although patients’ symptoms may improve, PD medication can be associated with severe side effects. For example, dyskinesia, or involuntary writhing and jerking, is a side effect that sometimes accompanies the medication peaks of the powerful anti-PD drug levodopa.

When medication levels decline before the next dose, patients may have “off” or “wearing off” symptoms. During this time, PD patients can have difficulty performing activities such as walking, speaking or eating and may experience painful muscle cramps.

Helping patients manage PD requires more than prescribing medication. Physical and occupational therapies improve a patient’s ability to accommodate changes in gait, balance and dexterity. Diet and exercise lessen problems with constipation and can improve a patient’s sense of well-being. Psychological counseling helps relieve PD-related depression.

Surgical procedures, such as deep brain stimulation (DBS), are a relatively new way to manage this progressive illness. Deep
One of the early important clues to understanding PD involved studying the substantia nigra, a part of the brain responsible for dopamine production. Dopamine is a neurotransmitter that helps regulate movement, balance and walking. In addition to controlling how the brain regulates body movements, dopamine also influences cognition, creative drive, motivation, sleep, mood, attention and learning. Research shows that abnormally high dopamine levels are associated with psychosis and schizophrenia. Because many of the medications used to treat psychiatric conditions interfere with normal dopamine processing, this class of antipsychotics can cause parkinsonian symptoms as a side effect.

The death of a specific group of dopamine-producing cells in the substantia nigra produces characteristic PD signs and symptoms. Research shows that patients experience PD symptoms after losing about 80% of their dopamine-producing cells.

The lack of sufficient dopamine disrupts communication between the substantia nigra and the corpus stratum and prevents the brain from orchestrating smooth and spontaneous body movements. Insufficient dopamine produces the following observable signs:

- Tremor – involuntary trembling of the limbs.
- Rigidity – inability to make rapid and spontaneous movements.
- Akinesia – slowness in initiating and maintaining movement.
- Postural instability – bending of the body associated with changes in gait and difficulties with balance.

The descriptive acronym TRAP that denotes these signs is a reminder that people who have PD often report feeling trapped in their body.

The slow onset of signs and symptoms can make early-stage PD symptoms difficult to diagnose. Some early symptoms include lack of facial expression, cramped handwriting, difficulty in getting out of a chair, inattention and irritability. Often patients experience these symptoms for a long time before they or other people notice something is wrong.

**Clinical Diagnosis**

Currently, no medically approved blood or imaging tests reveal either the depletion of brain dopamine or the accompanying changes in brain activity. Therefore, the patient’s medical history and neurological assessment are the basis for making a PD diagnosis. Because many other neurologic conditions such as essential