Parkinson’s Disease

What is Parkinson’s disease?

Parkinson’s disease is a common, slowly progressive, neurodegenerative disease. It results from the degeneration of neurons in the substantia nigra, a region of the brain that controls movement. This degeneration results in a shortage of a neurotransmitter called dopamine, therefore, causing impaired movement. The first symptoms of the disease are usually seen later in life, 40 years or older. Parkinson’s disease is often called primary parkinsonism or idiopathic Parkinson’s Disease to distinguish it from other forms of parkinsonism.

In the United States alone, about 1 million people (about 1% of the population over the age of 50) are currently diagnosed with Parkinson’s disease and about 50,000 new cases are reported each year. We can expect the number of new cases to grow as the average age of the population increases. The disease is most frequently seen in people in their 70s and 80s with a slightly higher incidence in Caucasians, than in African-Americans and Asians. In recent years, more “early” onset (in people under 40) cases have been seen.

What are the Symptoms of Parkinson's Disease?

The symptoms of Parkinson's Disease vary in both kind and severity amongst individuals and can progress at different rates throughout the disease. In most cases, the first symptom seen is a tremor, trembling or shaking, in a limb on one side of the body while the body is at rest. Early symptoms are typically mild and progress gradually.

Common Early Symptoms of Parkinson's Disease

- Tiredness
- Difficulty standing from a sitting position
- Shakiness
- Changes in speech
- Handwriting that looks cramped or "spidery"
- Losing track of words or thoughts
- Irritability and depression
- Lack of facial expression and animation
- Slow movements
- Inability to move
- Rigid limbs
- Shuffling gait
- Stooped posture

Major symptoms
There are four symptoms that the majority of Parkinson’s disease patients experience.

- **Rigidity**: stiffness when an arm, leg, or the neck is moved. The muscles remain constantly tensed and contracted, so the person feels stiff and/or weak.
- Resting tremor: a tremor which occurs when the person is at rest. This often begins with an occasional trembling of one hand, most obvious when the person is at rest or under stress. In about
75% of cases, this tremor affects only one body part or side of the body initially, and then becomes more generalized over time.

- **Bradykinesia**: slowness in initiating movement. This may also contribute to decreased facial movement, change in speech, shuffling gait and trouble with fine-fingered movements. Many patients find this to be the most frustrating aspect of their disease. It results in a loss of independence as it progresses, due to difficulties performing everyday functions, such as getting dressed, using utensils, and rising from chairs or bed.
- Loss of **postural reflexes** or postural instability: resulting in poor balance and coordination. Patients sometimes develop a forward or backward lean and fall easily. This can also cause stooped posture, bowed head and drooped shoulders.

### Secondary Symptoms of Parkinson's Disease

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<tr>
<td>Dementia</td>
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### What Causes of Parkinson's Disease?

Parkinson’s disease is associated with a gradual loss of cells in the substantia nigra, which produces dopamine. Dopamine is a chemical messenger that transmits a signal between two regions of the brain, the substantia nigra and the corpus striatum to regulate muscle activity. Insufficient dopamine in the striatum causes the nerve cells in this region to “fire” out of control leaving the individual unable to direct or control movements in a normal manner. This is thought to lead to the initial symptoms of Parkinson’s disease. Later in the disease, other areas of the brain and nervous system degenerate.

The exact cause for the loss of cells is unknown. Possible causes currently being researched are:

- **Genetic predisposition**: The inheritance of a gene passed down from a previous generation
- **Free radicals** are unstable molecules produced during normal chemical reactions in the body. When these molecules interact with other molecules they have the ability to damage a variety of tissue types, including neurons.
- **Environmental toxins**: This has been seen in people who took an illegal drug contaminated with a chemical called, MPTP. These individuals developed severe Parkinson-like symptoms. This also occurred in the early 1900’s in individuals who had suffered from a severe form of influenza.
- **Accelerated aging**: As a person ages, there is a normal wearing away of dopamine producing neurons, which leads to the premature loss of dopamine.

### Genetics

15-20% of Parkinson’s disease patients have a close relative who has also experienced parkinsonian symptoms. This leads us to believe that there may be a genetic component involved in Parkinson's disease. Studies with Parkinson’s disease twins and families have shown a multifactorial pattern of inheritance. This means that there may be a genetic component that makes a person more susceptible to developing Parkinson's disease, but is not enough to cause the disease. Development of the disease is dependent up on the influence of environmental factors.
The National Human Genome Research Institute (NHGRI) and the National Institute of Neurological Disorders and Stroke (NINDS) have found a gene on chromosome 4, the alpha synuclein gene, that may lead to Parkinson’s in some families. Researchers believe that this mutated, or changed, gene may account for only a small proportion of the total number of Parkinson’s disease cases, but may be responsible for a significant proportion of familial Parkinson’s disease with an onset before the age of 60.

The discovery of the alpha-synuclein gene helps to explain the causes of Parkinson’s disease and demonstrates a connection between Parkinson’s disease research and research into other neurodegenerative disorders. Alpha-synuclein is the main component of Lewy bodies, which are found in all patients with Parkinson's disease. When the changed version of this gene is present, an altered protein product is formed. It is thought that this altered protein accumulates in the cell and attracts other proteins in order to form a deposit which damages the cell.

**How is Parkinson's Disease Diagnosed?**

A neurologist usually diagnoses Parkinson’s disease. Anti-Parkinson’s drugs are prescribed to confirm the diagnosis. If the patient responds to these drugs, a diagnosis of Parkinson’s can be made. If the patient does not respond to these drugs, other diagnoses will be researched. Brain scans can help doctors determine if a person has true Parkinson’s disease or if it may be another disorder that resembles it. Lewy bodies are the trademark characteristic of the disease, but can only be seen by autopsy. An interesting finding is that a large number of older people without a diagnosis of Parkinson’s disease are shown to have Lewy bodies upon autopsy (8% of people over 50; 13% of people over 70; and 16% of people over 80). This leads us to believe that there may be many undiagnosed cases of Parkinson’s disease in the general public.

**How is Parkinson's Disease Treated?**

There is no cure for Parkinson’s disease, therefore treatment is symptom specific. A comprehensive approach, including early diagnosis, exercise, good nutrition and medications, is thought to work best in relieving symptoms. Also, some may opt for surgical intervention.

**Medications**

Medications are used to relieve the symptoms of Parkinson’s disease. The type and dosage of each medication is tailored to each person’s individual needs.

- **Levodopa (L-dopa).** Nerve cells use l-dopa to make and replenish the brain’s supply of dopamine. L-dopa is often given along with carbidopa. Carbidopa delays the conversion of levodopa into dopamine until it reaches the brain. This prevents, or diminishes some of the side effects of L-dopa and reduces the amount of L-dopa needed. L-dopa delays the onset of debilitating symptoms and allows many patients to extend the period of time they are able to live “normal” lives. Bradykinesia and rigidity respond best and tremor may be only slightly reduced.

- **Bromocriptine, pergolide, pramipexole, and ropinirole.** These drugs all mimic the role of dopamine in the brain.

- **Selegiline (deprenyl).** This drug may delay the need of l-dopa therapy. When given with l-dopa, it seems to enhance and prolong the response of l-dopa.

- **Anticholinergics.** These may help control tremor and rigidity. They appear to act by blocking the action of acetylcholine.

- **Amantadine.** This is an antiviral drug. It is effective at reducing many symptoms, but its efficacy wears off after several months. Effectiveness may return after a brief withdrawal.
**Diet and Exercise**
If a person is taking L-dopa, their doctor may recommend adjusting the amount of protein in their diet, since protein may interfere with the absorption of the drug. Swimming, walking, physical therapy, and muscle strength exercises help to maintain muscle tone and strength and improve mobility. Full range of motion exercises improve balance, walking, and strength.

**Surgery**
Surgery is not performed as often since the discovery of L-dopa.

- **Cryothalamotomy**: a supercooled metal tipped probe is surgically inserted into the thalamus to destroy areas of the brain that are producing tremors.
- **Pallidotomy**: a portion of the brain, the globus pallidus, is lesioned. This may improve tremor, rigidity, and bradykinesia, possibly by interrupting the neural pathway between the globus pallidus and the corpus striatum or thalamus.
- **Deep brain stimulation (DBS)**: implantation of an electrical stimulator, similar to a cardiac pacemaker, to counteract the loss of dopamine producing cells in the substantia nigra. In contrast to the other two forms of surgery, DBS does not form permanent brain lesions.
- Transplantation of healthy dopamine-producing tissue into the brain is currently being tested.

**Information and Support Groups**

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<tbody>
<tr>
<td>National Organization for Rare Disorders, Inc. (NORD)</td>
<td>P.O. Box 8923, New Fairfield, CT 06812-8923</td>
<td>(203) 746-6518, (800) 999-6673, (203) 746-6481</td>
<td><a href="mailto:orphan@rarediseases.org">orphan@rarediseases.org</a></td>
<td><a href="http://www.rarediseases.org">http://www.rarediseases.org</a></td>
</tr>
<tr>
<td>Parkinson's Disease Foundation, Inc.</td>
<td>William Black Medical Building, Columbia-Presbyterian Medical Center, 710 West 168th Street, New York, NY 10032--9982</td>
<td>(212) 923-4700, (800) 457-6676</td>
<td><a href="mailto:info@pdf.org">info@pdf.org</a></td>
<td><a href="http://www.parkinsonsfoundation.org">http://www.parkinsonsfoundation.org</a></td>
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<tr>
<td>NIH/National Institute of Neurological Disorders and Stroke</td>
<td>31 Center Dr MSC 2540, Building 31 Rm 8A16, Bethesda, MD 20892</td>
<td>(301) 496-5751, (800) 352-9424</td>
<td></td>
<td><a href="http://www.ninds.nih.gov/">http://www.ninds.nih.gov/</a></td>
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<td>Parkinson's Action Network</td>
<td>840 3rd Street, Santa Rosa, CA 95404</td>
<td>800-850-4726</td>
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<td><a href="http://www.parkinsonaction.org">www.parkinsonaction.org</a></td>
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<tr>
<td>Michael J. Fox Foundation for Parkinson's Research</td>
<td>840 Third Street, Santa Rosa, CA 95404</td>
<td>800-708-7644</td>
<td></td>
<td><a href="http://www.michaeljfox.com">http://www.michaeljfox.com</a></td>
</tr>
<tr>
<td>WE MOVE (Worldwide Education and Awareness for Movement Disorders)</td>
<td>Mt. Sinai Medical Center, One Gustave L. Levy Place Box 1052, New York, NY 10029</td>
<td>(212) 241-8567, (800) 437-6682</td>
<td><a href="mailto:wemove@wemove.org">wemove@wemove.org</a></td>
<td><a href="http://www.wemove.org">http://www.wemove.org</a></td>
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