Parkinson Disease

Description/Etiology

Parkinson disease (PD) is a progressive neurodegenerative disorder involving a deficiency of the neurotransmitter dopamine. This chronic, debilitating condition is characterized by a variable combination of tremor, bradykinesia (i.e., slowed ability to start and continue movements), rigidity, and postural instability.

In PD, degenerative changes occur in the substantia nigra pars compacta, which is an area of the brain that produces dopamine. The resulting dopamine shortage affects voluntary movement and leads to the clinical manifestations of PD. The etiology of PD is unknown and current research focuses on multifactorial causes, including the interaction of genetics with environmental factors and the aging process. Onset is insidious and PD usually begins unilaterally with mild signs and symptoms, but it eventually manifests bilaterally with increasingly severe signs and symptoms. Advancing disease erodes all functional abilities, causing autonomic dysfunction, musculoskeletal deformities, sensory manifestations, sleep disturbances, dermatologic abnormalities, and psychiatric manifestations. Common complications include falls, aspiration pneumonia, respiratory and urinary tract infection, malnutrition, contractures, orthostatic hypotension, dyskinesia (i.e., impaired ability to perform voluntary movement), akinesia (i.e., loss of muscle movement), and dementia.

Diagnosis is based on clinical presentation, physical examination (including neurologic evaluation), medical history (including drug history), and the presence of two of the three cardinal manifestations of PD, which are asymmetric resting tremor, rigidity with pain, and bradykinesia. Differential diagnosis includes depression, another illness, or a different nervous system disorder, multisystem atrophy, progressive supranuclear palsy, corticobasal degeneration, diffuse Lewy body disease, cardioembolic stroke, and other multisystem neurologic disorders.

Although disease progression is not preventable, pharmacotherapy can control manifestations, maintain patient independence, slow progression, and improve quality of life. The highly individualized and age-related response to medication necessitates a trial-and-error prescribing approach that is difficult for both patient and family. Eventually, medications lose effectiveness, the patient’s disability increases, and care becomes palliative. Surgical treatment options of thalamotomy (i.e., surgical destruction of the thalamus), pallidotomy (i.e., surgical destruction of the globus pallidus), and deep brain stimulation can be considered for patients with advanced PD. However, surgery neither alters the course of the disease nor produces permanent improvement.

Facts and Figures

More than 1 million persons in North America have PD. The incidence of PD increases with age and the average age at PD onset is ~ 60 years. PD affects 5:100,000 persons who are < 40 years of age likely secondary to genetic mutations, and 700:100,000 persons who are > 70 years of age. PD is approximately 3-4 times more common in men than in women aged 60-79 years, but no significant differences in other age groups. Approximately 30-40% of patients with PD develop dementia that is similar to Alzheimer’s disease; dementia is 4–6 times more common in patients with PD than in the general population.
**Risk Factors**

Risk factors for PD include heredity and male sex; exposure to pesticides or herbicides slightly increases PD risk, and reduced estrogen levels may increase PD risk in women. Rare familial forms of PD have been linked to at least seven causative genes; of these, the most well known is the *parkin* gene, which causes early onset autosomal-recessive PD and isolated juvenile-onset PD in individuals who are ≤ 20 years of age. In addition, drug-induced Parkinsonism is characterized by Parkinson-like symptoms such as resting tremor and bradykinesia that can develop within 3-12 months after treatment initiation or change in dosages.

**Signs and Symptoms/Clinical Presentation**

Cardinal manifestations of PD are asymmetric resting tremor of the forearm and hand (i.e., pronation/supination; called “pill rolling”); rigidity with pain in the upper body, spine, or legs; and bradykinesia. Other signs and symptoms include cog wheeling (i.e., jerky limb movement), extreme fatigue, difficulty initiating movement, and hypokinesia (i.e., decreased motor reaction to stimulus). The clinical presentation can also include gait disturbances, postural abnormalities and instability, drooling, dysphagia (i.e., difficulty swallowing or inability to swallow), blinking abnormalities, dysphonia (i.e., difficulty speaking), hypophonia (i.e., extremely weak voice), hypomimia (i.e., reduced facial expression), micrographia (i.e., abnormally small, cramped handwriting and/or progression to continually smaller handwriting), fatigue, sleep disorders, pain, orthostatic hypotension, cognitive dysfunction, memory impairment, anxiety, depression, dementia, psychosis, and hallucinations.

**Assessment**

- **Physical Findings of Particular Interest**
  - Onset of motor manifestations (e.g., tremor) in PD tends to be asymmetric; this asymmetry is useful in distinguishing PD from other causes of parkinsonism
  - Decreased spontaneous eye blink rate, speech impairment, and a shuffling, short-stepped gait might be present

- **Laboratory Tests That Can Be Ordered**
  - There are no specific laboratory tests that diagnose PD; a positive response to antiparkinson drugs confirms the PD diagnosis
  - Complete blood count (CBC) and basic metabolic panel (BMP) can be ordered to establish baseline levels
  - Serum therapeutic drug levels can be ordered if drug-induced Parkinsonism is suspected
  - In some cases, genetic testing for specific mutations that are known to cause PD can be ordered

- **Other Diagnostic Tests/Studies**
  - Neuroimaging studies (e.g., MRI) can be performed to distinguish between PD and other neurodegenerative conditions, tumors, or strokes

**Treatment Goals**

- **Promote Symptomatic Relief and Slow Disease Progression**
  - Assess patient status, including vital signs, all physiologic systems, and functional ability; follow facility protocols for initiating fall precautions as appropriate, especially for patients with orthostatic hypotension and during medication adjustments
    - Frequent positional BP monitoring and close supervision during functional mobility is important for patients with orthostatic hypotension
  - Administer antiparkinson medications, which can be ordered as monotherapy or in combination and include L-dopa/carbidopa (e.g., levodopa/carbidopa), dopamine receptor agonists (e.g., ropinirole, pergolide, pramipexole), anticholinergics, antivirals, and MAO inhibitors
    - Drug algorithms are individualized and drugs must be administered at the exact time ordered; observation of mobility response and sudden “on and off” or “freezing” manifestations will assist the treating clinician with prescribing the appropriate treatment regimen
  - Request referral to physical therapy, occupational therapy, and speech therapy, as appropriate, to treat impaired physical abilities, reduce risk for falls, improve mobility, and teach creative adaptations in the home environment
  - Follow facility pre- and post-surgical protocols if patient becomes a surgical candidate; reinforce pre- and post-surgical education and verify completion of facility informed consent documents

- **Promote Reduced Risk for Disease-Related Complications and Adverse Drug Effects**
  - Promote adequate nutrition with supplemental vitamins and feedings, frequent small meals, allowance of extra time for eating, and referral to a dietitian for patient evaluation and education; monitor weight
• Prevent bowel and bladder dysfunctions (e.g., constipation, incontinence) by encouraging high fluid intake, consumption of foods high in fiber and bulk, use of a raised toilet seat, establishment of a toileting schedule, use of a commode or urinal, and administering medications as ordered
• Alleviate excessive perspiration, drooling, and skin breakdown with frequent assessment, bathing, changes of position, and clothing changes
• Improve impaired communication by providing a quiet environment, exhibiting patience when the patient talks, and collaborating with the family and a speech pathologist regarding patient preferences for communication
• Support optimum mental health by frequent assessment of patient’s anxiety level and coping ability and for depression; provide emotional support and request referral to a mental health clinician, if appropriate, for supportive counseling regarding mental disturbances and impaired coping
• Assess patient/family for knowledge deficits related to PD, educate, and encourage discussion regarding PD pathophysiology, potential complications, treatment risks and benefits, and individualized prognosis. Request referral to a social worker for identification of resources for support groups, educational programs, Internet information and support, and in-home services

Food for Thought
› PD is difficult to diagnose with certainty in its early stages; up to 25% of patients who are initially diagnosed with PD are subsequently given a different diagnosis, although approximately 90% of cases are diagnosed correctly in the advanced stages of the disease
› Authors of a review article indicated cannabis and its related compounds(e.g., canabidiol [CBD]) as an effective alternative or adjunct therapy for motor symptoms (e.g., tremor, rigidity) and/or non-motorsymptoms (e.g., depression, anxiety, sleep disorders) associated with advanced stages of PD (Babayeva et al., 2016)
› Carbon monoxide poisoning appears to be a risk factor for later development of PD. Researchers in China compared PD in 9,012 adults diagnosed with carbon monoxide poisoning and 36,048 controls and concluded that carbon monoxide poisoning is associated with a 14.3-fold increased risk of PD (Lai et al., 2015)
› Falls are common in patients with PD, occurring in up to 87%; early identification of patients at highest risk of falls and promptly implementing fall precautions, are important. Investigators in a study of 36 patients with PD reported that the addition of a cognitive test, to the Timed Up and Go Test, a commonly used mobility assessment tool, enhanced the identification of fall risk in patients with PD (Vance et al., 2015)
› Subclinical motor deficits might be present decades before the clinical onset of PD. Researchers in Sweden studied 1.3 million men who had their muscle strength measured during military enlistment and reported that maximal upper extremity voluntary muscle force was significantly reduced in late adolescence in men who developed PD 30 years later (Gustafsson et al., 2015a)
› Depression might be a risk factor for or an early sign of PD. Investigators in Sweden conducted a nationwide cohort study including 140,688 persons with depression and 421,943 without depression and found that risk of PD was increased 3.2-fold within the first year of depression and 1.5-fold after 15–25 years (Gustafsson et al., 2015b)

Red Flags
› Antiparkinson medications must be continuously monitored for efficacy and have significant adverse effects; knowledge of details for each drug, close patient monitoring, and frequent patient assessment are essential
› Drug-induced (e.g., antidepressants, antiarrhythmics, anticonvulsants) Parkinsonism is irreversible in 10% of cases, and associated with increased morbidity and mortality rates
› Parkinsonian crisis, caused by sudden withdrawal of medication or by severe emotional disturbance, is a medical emergency that requires prompt respiratory and cardiac support, administration of antiparkinson medication, and administration of a sedative
› Patients with PD should be targeted for interventions to prevent falls and other injuries

What Do I Need to Tell the Patient/Patient’s Family?
› Educate about the importance of maintaining good physical and mental health, continued independence, strict adherence to the prescribed treatment regimen, and becoming educated about PD
› Educate that frequent healthcare visits are necessary throughout life to manage medication, screen for adverse effects and complications, and provide individualized therapy for increasing disability
› Advise patients and their families about resources that are available through the National Parkinson Foundation at http://www.parkinson.org and the American Parkinson Disease Association at https://www.apdaparkinson.org/
References