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My46 Trait Profile

Parkinson's disease

Parkinson's disease is a progressive movement disorder. It is most often caused by a combination of genetic and environmental risk factors, however in some cases it can be cause by mutations in any one of many different genes.

Characteristics of Parkinson's disease

Parkinson's disease (PD) is the second most common neurodegenerative disease (conditions that cause a progressive loss of parts of the nervous system structure or function) after Alzheimer's disease, affecting 1-2% of people over the age of 65. It is characterized by rest tremor (i.e., rhythmic shaking when the muscles are relaxed and at rest), bradykinesia (slow movement), stiffness or rigidity (spasticity), and problems with balance and coordination. It is a chronic and progressive condition, meaning that symptoms continue and worsen over time. Other accompanying features include freezing (inability to continue walking; often seen as hesitating before stepping forward), small hand writing, loss of sense of smell, hoarse voice with low volume, loss of facial expression, sleep disorder, and mood and cognitive (thinking) changes.

PD can be divided according to the age of onset. Juvenile PD occurs before the age of 20; young or early onset PD refers to those cases with onset between age 20 and 41; adult onset PD occurs over the age of 41. The symptoms of PD are largely due to the loss of nerve cells that produce a brain chemical called dopamine. Dopamine helps control muscle movement, coordination, behavior, and other mental health processes (e.g., thinking).

Diagnosis/Testing

Diagnosis of PD is based on a thorough neurological evaluation. Additional testing might include neuroimaging (e.g., MRI) to evaluate whether there is a loss of dopamine in the brain. Several genes have been associated with PD: changes or mutations in the PARK2, PINK1, and PARK7 genes cause juvenile and/or early onset PD; and mutations in the SNCA, UCHL1, and LRRK2 genes cause adult onset PD. However, most cases of PD are due to the effects of multiple genes and multiple environmental factors.

Management/Surveillance

Many different medications are used in the treatment of PD (e.g., carbidopa/levodopa (medication that allows more dopamine to get to the brain), dopamine agonists (medications that mimic the effects of dopamine), anticholinergics (medications that can be help treat tremor), and MAO-B inhibitors (medications that prevents the breakdown of dopamine). All of these medications can have side effects and need to be monitored carefully. Some individuals with PD are good candidates for deep brain stimulation surgery in which electrodes are implanted which are controlled by an impulse generator implanted near the collarbone. Management of PD includes fall prevention, physical and occupational therapy to maintain strength and flexibility, as well as treatment for depression.

Mode of inheritance

Juvenile and early onset PD are often inherited in an autosomal recessive pattern. This means that an individual has to inherit two mutations (i.e., one from each parent) to be affected with PD. If both parents are carriers of a mutation, they have a 1 in 4 (25%) chance with each pregnancy of having a child with PD.

Hereditary adult onset PD is more likely to be inherited in an autosomal dominant pattern. This means inheriting

one mutation is enough for an individual to be affected. The mutation can be inherited from an affected parent or it can occur brand new (de novo) in an affected child. However, sometimes the mutation might not result in disease symptoms. This is called penetrance. In the adult onset cases with LRRK2 mutations, family history may be missing because of incomplete or age-dependent penetrance. Thus, some relatives might have the mutation, but not develop symptoms until late in life.

Most cases of PD are complex, which means that it is caused by a combination of many different factors. These factors can be genetic or non-genetic (such as environmental factors and lifestyle choices). Complex conditions are inherited in a multifactorial pattern. This means that the chance for an individual to develop PD is influenced by the number and type of genetic and non-genetic factors that occur together to which an individual is exposed. In other words, no single gene, and no single environmental factor cause PD. However, not all of these genetic factors and environmental factors are known.

Risk to family members

For most cases of PD (that follow a multifactorial inheritance pattern), approximately 10% of individuals have at least one other affected family member. In large population studies, researchers have found that people with an affected first degree relative (e.g., a parent or sibling) have a 4% to 9% higher chance of developing PD, as compared to the general population.

Special considerations

None

Resources

American Parkinson Disease Association (APDA)
http://www.apdaparkinson.org
Michael J. Fox Foundation for Parkinson's Research
http://www.michaeljfox.org
Genetics Home Reference: Parkinson disease
http://ghr.nlm.nih.gov/condition/parkinson-disease
National Parkinson Foundation
http://www.parkinson.org
Parkinson's Disease Foundation (PDF)
http://www.pdf.org
WE MOVE: Worldwide Education and Awareness for Movement Disorders
http://www.wemove.org

References

Klein, C. et al. (2012)."Genetics of Parkinson's disease." Cold Spring Harbor Perspectives in Medicine 2(1): a008888.
Pankratz ND, Wojcieszek J, Foroud T. (Updated 9 July 2009). Parkinson Disease Overview. In: GeneReviews at GeneTests Medical Genetics Information Resource (database online). Copyright, University of Washington, Seattle. 1997-2013. Available at http://www.ncbi.nlm.nih.gov/books/NBK1223/. Accessed [04/10/2013].
Shulman, JM. et al. (2011)."Parkinson's Disease: Genetics and Pathogenesis." Annual Review of Pathology 6: 193-222.
Wirdefeldt, K. et al. (2011)."Epidemiology and etiology of Parkinson's disease: a review of the evidence." European Journal of Epidemiology Suppl 1: S1-58.

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