

Parkinson's disease: modern diagnostic methods and treatment strategies.

Ahmadova Farxunda

Mustayev Shohjahon

Clinic Ordinator of Neurology

Samarkand State Medical University

Abstract

Parkinson's disease is a progressive neurodegenerative disorder primarily affecting movement and motor control. It is characterized by the degeneration of dopaminergic neurons in the substantia nigra, leading to dopamine deficiency within the basal ganglia. Parkinson's disease is the second most common neurodegenerative disorder after Alzheimer's disease and represents a significant public health challenge due to its increasing prevalence among aging populations. Advances in neuroimaging, biomarker research, and therapeutic interventions have improved the diagnosis and management of the disease. This article reviews the clinical features, diagnostic approaches, and current treatment strategies for Parkinson's disease.

44

Keywords: Parkinson's disease, neurodegenerative disorders, dopamine, tremor, bradykinesia, neuroimaging, levodopa, deep brain stimulation.

Parkinson's disease (PD) is a chronic and progressive neurological disorder that affects millions of individuals worldwide. The disease was first described by the British physician James Parkinson in 1817 as a "shaking palsy." Today, Parkinson's disease is recognized as a complex neurodegenerative condition involving both motor and non-motor symptoms that significantly affect quality of life.

The pathological hallmark of Parkinson's disease is the progressive loss of dopamine-producing neurons in the substantia nigra pars compacta. The resulting dopamine deficiency disrupts normal motor control and leads to characteristic clinical manifestations. Although the exact cause remains unknown, genetic and environmental factors are believed to contribute to disease development. The pathogenesis of Parkinson's disease is multifactorial and involves genetic susceptibility, mitochondrial dysfunction, oxidative stress, neuroinflammation, and abnormal protein aggregation. One of the key pathological features is the accumulation of alpha-synuclein protein within neurons, forming intracellular inclusions known as Lewy bodies.

Several genetic mutations have been associated with familial forms of Parkinson's disease, including mutations in the SNCA, LRRK2, PARKIN, PINK1, and DJ-1 genes. Environmental risk factors such as exposure to pesticides, heavy metals, and industrial toxins have also been implicated. Neuronal degeneration gradually reduces dopamine levels within the basal ganglia, impairing communication between brain regions responsible for movement coordination. The diagnosis of Parkinson's disease remains primarily clinical, based on characteristic symptoms and neurological examination. However, several modern diagnostic tools enhance diagnostic accuracy.

Neurological assessment focuses on identifying bradykinesia in combination with tremor or rigidity. Standardized rating scales such as the Unified Parkinson's Disease Rating Scale (UPDRS) are commonly used to evaluate disease severity. Magnetic resonance imaging (MRI) is mainly performed to exclude alternative neurological conditions. Although conventional MRI findings are often normal in Parkinson's disease, advanced imaging techniques can provide valuable information about structural and functional brain changes. Dopamine transporter

imaging (DaTSCAN) allows visualization of dopaminergic neuron loss and assists in differentiating Parkinson's disease from other movement disorders. Positron emission tomography (PET) and single-photon emission computed tomography (SPECT) contribute to the assessment of dopamine metabolism and neuronal function. Recent research has focused on identifying biological markers in cerebrospinal fluid, blood, and peripheral tissues.

References

1. Bloem B.R., Okun M.S., Klein C. Parkinson's Disease. *The Lancet*. 2021;397(10291):2284–2303.
2. Poewe W., Seppi K., Tanner C.M., et al. Parkinson Disease. *Nature Reviews Disease Primers*. 2023;9(1):1–25.
3. Armstrong M.J., Okun M.S. Diagnosis and Treatment of Parkinson Disease. *JAMA*. 2020;323(6):548–560. 46
4. Kalia L.V., Lang A.E. Parkinson's Disease. *The Lancet*. 2015;386(9996):896–912.
5. Simon D.K., Tanner C.M., Brundin P. Parkinson Disease Epidemiology, Pathology, Genetics, and Pathophysiology. *Clinical Geriatric Medicine*. 2022;38(2):181–200.