

# Parkinson Disease - A Comprehensive Overview

## Biomedical Engineering - URJC

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# Introduction

## Definition of Parkinsonism

- Broad term for neurodegenerative diseases with motor symptoms (rigidity, tremors, bradykinesia).
- Parkinson disease accounts for  $\sim 80\%$  of cases.

## Historical Context

James Parkinson's 1817 essay: *An Essay on the Shaking Palsy*.

# Classification

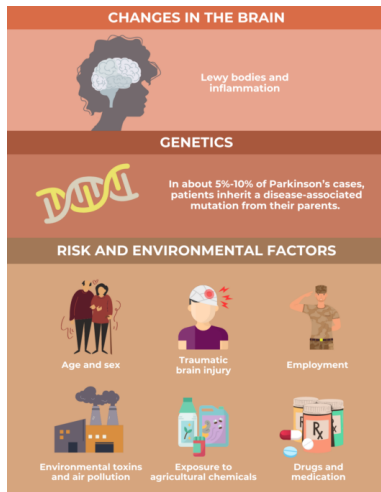
## Parkinson's Disease

- Most common cause of parkinsonism.
- Dopaminergic neuronal loss in the midbrain.
- Positive response to levodopa therapy.

## Secondary Causes of Parkinsonism

- Normal pressure hydrocephalus (NPH).
- Vascular parkinsonism.
- Drug-induced parkinsonism.
- Toxin-induced parkinsonism.
- Chronic traumatic encephalopathy.

# Parkinsonism



# Epidemiology

## Parkinson Disease

- Prevalence: 1-2 per 1000 individuals.
- Higher incidence in men (1.5:1 male-to-female ratio).
- Increases with age (1% of population aged 60+).

## Vascular Parkinsonism

- 2.5%-5% of parkinsonism cases.
- Associated with cerebrovascular disease.

## Drug-Induced Parkinsonism

- Prevalence: 1.7%-2.7%.
- Increases with age (60-80 years).

# Etiology

## Key Findings

- Loss of pigmentation in *substantia nigra* (1919).
- Dopaminergic neuron loss (1950s).

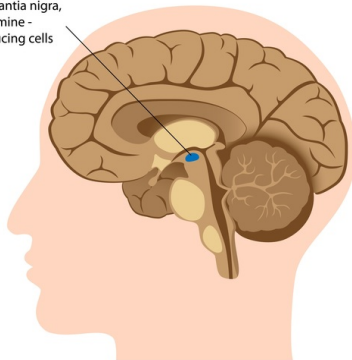
## Histopathology

- Lewy bodies (alpha-synuclein inclusions).
- Selective neuronal loss in *substantia nigra pars compacta*.

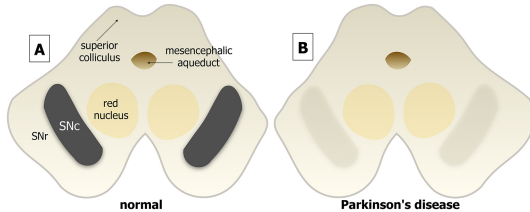
# Parkinsonism

## Parkinson's disease

Substantia nigra,  
dopamine -  
producing cells

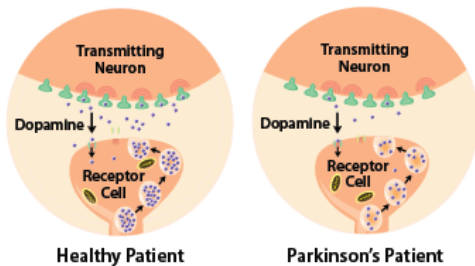


# Parkinsonism





# Parkinsonism



# History and Physical Examination

## Core Features

- Tremor (unilateral, resting, reemerging).
- Bradykinesia (slowness in tasks, walking).
- Rigidity (stiffness, lead pipe/cogwheel rigidity).
- Gait disturbance (flexed posture, festination).

## Autonomic Symptoms

- Orthostatic hypotension, constipation, urinary retention.

## Neuropsychiatric Symptoms

- Depression, dementia, hallucinations.

# Parkinsonism



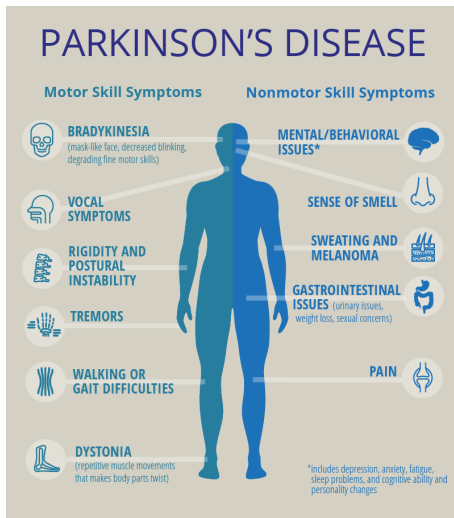
**T** Tremor: shaking, usually starting on one side

**R** Rigidity: stiffness of the limbs, neck, or trunk

**A** Akinesia: loss or impairment in power of voluntary movement

**P** Posture and balance

# Parkinsonism



# Treatment / Management

## Medications

- Levodopa-carbidopa (mainstay treatment).
- Dopamine agonists, MAO-B inhibitors.

## Multidisciplinary Approach

- Physical therapy, music therapy, cycling, boxing.
- Addressing depression, carer fatigue, sleep disorders.

## Limitations

- Levodopa does not modify disease progression (symptomatic only).

# Parkinsonism

Parkinson's disease is the result of lack of dopamine production in the brain. Symptoms may include:



Tremors



Stiffness



Changes in  
speech, voice  
and swallowing



Slowness of  
movement



Balance  
problems



Trouble with  
handwriting

## Deep Brain Stimulation (DBS)



DBS is a surgery that provides patients with relief from many Parkinson's disease symptoms through electrical stimulation in the brain. It is highly effective in properly selected, moderately advanced patients.

Over **1,000** electrode implantations performed

**50%**

average reduction  
in medications  
after DBS

## Most comprehensive care available in the region



Specially  
trained  
clinicians



Nutrition



Exercise



Clinical  
trials



Imaging/  
testing



Education  
and support



Medications

# Prognosis and Complications

## Prognosis

- Disease duration: ~10 years.
- Early therapy improves life expectancy.

## Complications

- Dementia, autonomic dysfunction, mood disorders.
- Levodopa-induced dyskinesia (involuntary movements).

# Conclusion

## Key Takeaways

- Parkinson disease is the most common cause of parkinsonism.
- Early diagnosis and multidisciplinary management improve outcomes.
- Levodopa remains the cornerstone of symptomatic treatment.