CHAPTER 3

Parkinson’s Disease

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Objectives

Identify Symptoms of Parkinson’s Disease (PD)

Understand possible causes of PD

List treatment options for PD
Parkinson's disease (PD):

Is a neurodegenerative disorder

Develops around age 50
* incidence rises with age
* affects 1-2% of population > age 65

Higher incidence in men (62%) compared to women (38%)
Parkinson’s Disease - Introduction

Increasing proportion of elderly individuals PLUS PD & related neurodegenerative disorders CREATES Growing burden on health care system
Parkinson's Disease - Symptoms

Patients initially present with a triad of motor impairments:

1. tremor
2. rigidity
3. bradykinesia

Symptoms worsen as disease progresses.
Parkinson’s Disease - Symptoms

**Symptoms**

Tremors - Continued

usually unilateral
becomes bilateral
worsens with stress
Parkinson’s Disease - Symptoms

Tremors

Usually --
first symptom
occurs in the hands or arms
- can occur in head, face, jaw, & leg
disappears with purposeful movement
- such as picking up an object
Parkinson's Disease - Symptoms

Postural manifestations -

postural instability
rigidity

stooped

Postural changes cause balance instability
Patients also suffer from non-motor symptoms such as:
- cognitive impairments
- olfactory impairments
- dysphagia
- GI dysfunction
- sleep disturbances
- depression
# Parkinson’s Disease - Stages of Symptoms

<table>
<thead>
<tr>
<th>Stage</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Unilateral</td>
</tr>
<tr>
<td>Two</td>
<td>Bilateral</td>
</tr>
<tr>
<td></td>
<td>No balance impairment</td>
</tr>
<tr>
<td>Three</td>
<td>Balance impairment</td>
</tr>
<tr>
<td></td>
<td>Mild to moderate disease</td>
</tr>
<tr>
<td></td>
<td>Physically independent</td>
</tr>
<tr>
<td>Four</td>
<td>Severe disability</td>
</tr>
<tr>
<td></td>
<td>Still able to walk &amp; stand unassisted</td>
</tr>
<tr>
<td>Five</td>
<td>Wheelchair-bound or bedriddened</td>
</tr>
<tr>
<td></td>
<td>unless assisted</td>
</tr>
</tbody>
</table>
Question: Does daily stress worsen PD symptoms?

Answer: Yes, but only temporarily.

Stress is not the cause of PD.

Any stress can briefly worsen PD symptoms.

Stress-related symptoms resolve after stress is relieved.
Parkinson’s Disease - Symptoms

Quiz --PD Symptoms

Question #1

Are all the following symptoms of PD?

• bradykinesia
• tremor
• rigidity
• gastrointestinal dysfunction
• postural instability
• sleep disturbances
• cognitive impairments.

True  False
Parkinson’s Disease - Symptoms

You are correct!
Wrong!
The correct answer is true.

All the following are symptoms of PD

- bradykinesia
- tremor
- rigidity
- gastrointestinal dysfunction
- postural instability
- sleep disturbances
- cognitive impairments.
Parkinson’s Disease - Symptoms

Quiz -- PD Symptoms

Question #2

Postural instability, rigidity, and stooped posture places the PD patient at greatest risk for:

a. Sleeping
b. Sneezing
c. Falling
d. Dying
Parkinson’s Disease - Symptoms

You are correct!
Wrong!
Postural instability, rigidity, and stooped posture places the PD patient at greatest risk for **falling**.
**Question:** What causes the movement problems of PD?

**Answer:** Deficiency of the brain chemical **dopamine** occurs in the basal ganglia.

The Basal Ganglia is an area deep inside the cortex of the brain that coordinates normal muscle activity.
**Question:** What causes the dopamine deficiency?

**Answer:** Degenerative changes in the substantia nigra and striatum portions of the basal ganglia reduce dopamine production.  

Porth, 2005

[Image: Cross section of striatum and substantia nigra]
In PD, cellular degeneration starts in the substantia nigra of the basal ganglia, where dopamine-producing nerve cells, called nigral cells, are formed.

Porth, 2005
Parkinson’s Disease - Pathophysiology

The Basal Ganglia

- In PD the striatum portion of the basal ganglia receives an inadequate amount of nigral cells, which impairs a person’s ability to control movement.
- The basal ganglion’s connection to the cortex and the thalamus also affects movement.

Porth, 2005
Parkinson’s Disease - Pathophyiology

Cells degenerate in substantia nigra (Sn)

Substantia nigra destroyed

Dopamine decreases

Muscle cell activation decreases

Movement control decreases
Question: What causes PD?

Answer: Process not understood completely

- May be combination of factors involving genetics, environmental agents, & abnormalities in cellular process.
What causes the movement problems of PD?

A. Excess amount of epinephrine
B. Inadequate amount of epinephrine
C. Excess amount of dopamine
D. Inadequate amount of dopamine
Deficiency of the brain chemical **dopamine** cause movement disorders.
Is Genetics a Factor in PD?

Recent discoveries support a genetic component to some familial forms of PD in both early-age and late-age onset.

15-25% of PD patients have a relative with PD.

Majority of PD cases occur without apparent genetic factor.

Recent studies discovered several genes that can cause PD

Some genes effect dopamine cell functions

Some genes affects are unknown

PD genetics research is on-going

Foroud, 2005

Question: How will identification of genetic mutation affect PD?

Answer:
1. might help scientists better understand how PD damages the brain & causes symptoms of the disease.
2. might lead to better therapies for Parkinson's disease and, hopefully, a cure!

Foroud, 2005
**Question:** Is PD an immune/inflammatory response?

**Answer:** Not certain.

Pathogenesis of PD as an immune response being studied

Link between PD and a pro-inflammatory cytokine shown in three recent studies

Indications are present but inconclusive

Hakansson, et al., 2005
**Question:** Do environmental agents cause PD?

**Answer:** Not certain.

Environmental link may be present - genetic factor may place person at increased risk when exposed to pesticides

Indications present but inconclusive

Jiang,, Ellis, & Greenlee, 2004
Parkinson’s Disease - Causes

Quiz-- PD Causes

All of the following are true except:

A. Majority of PD cases are due to an inherited gene.

B. PD is contagious

C. A link between PD and a pro-inflammatory cytokine shown in three recent studies

D. Pesticide exposure may be linked to PD.

While the majority of PD cases do not have a known cause, it is not contagious.
Wrong!

Please try again!
Parkinson’s Disease - Treatment

**Question:** What are some treatment approaches for PD?

**Answer:**

a. Medical therapy
b. Surgical therapy.

c. General lifestyle modifications
   * rest and exercise
   * physical therapy
   * speech therapy
Question: Do the treatments cure Parkinson's Disease or stop it from progressing?

Answer: No.

- Treatments do not cure the disease
- Goal is to alleviate symptoms and maintain independent function
Question: Is there a “best” treatment for PD?

Answer: No standard exists

Surgical treatment for PD is considered for patients who respond to medications but have intolerable side effects.
Medical Approaches

Question: Are PD patients given dopamine?

Answer: No.

- Dopamine itself does not pass the blood-brain barrier
- **Levodopa (L-dopa)** is given to pass into the brain and the nerve cells then use it to make dopamine
Other Medical Approaches

Dopamine-agonists: acts on dopamine receptors, mimics natural dopamine, not as effective as L-dopa
   - Meds: Bromocriptine, Pergolide, Pramipexole, Ropinirole

Anticholinergic: helps relieves tremor in mild to moderate disease
   - Meds: Benztropine, Biperidin, Orphenadrine, Trihexyphenidyl

Hickey, 2000
Surgical Approaches

a. Ablation
b. Deep Brain Stimulator

Parkinson’s Disease - Treatment

Surgical Approach--Ablation

- An area of the brain affected by PD is ablated (destroyed)

- Purpose: destroy tissue that produces abnormal chemical or electrical impulses that produce abnormal movements
Parkinson’s Disease - Treatment

Surgical Approach - Deep Brain Stimulation (DBS)

- Surgically implanted, battery-operated device delivers electrical stimulation to targeted areas in the brain
- Purpose: block abnormal nerve signals that cause tremor and PD symptoms
All of the following approaches are used to treat PD?

- a. L-dopa pills
- b. Dopamine pills
- c. Deep Brain Stimulation surgery

True  False