Parkinson’s Disease

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Presenting Symptoms

- Shuffling gait
- Marked bradykinesia
- Increasing rigidity
- Diplopia reading
Ocular Motor Performance

- Observe head position and posture
- Head movement + gaze
- Random eye movements
- Head tremor
- Eyelids blink rate (normal 25-30/min)
- Blepharospasm, clonus or apraxia
- Glabella hyperreflexia
Ocular Motor Signs

- Impaired convergence
- Slow hypometric horizontal saccades
- Normal vertical saccades
- Saccadic substitution for smooth horizontal pursuit
Convergence Insufficiency

Three factors:

Age

Parkinson’s disease

Medication (Sinemet)
Ocular Motor Deficits in PD

The dopaminergic nigrostriatal pathways affected in PD control the latency, velocity and amplitude of saccades and the gain (ratio of smooth EM velocity to target velocity) of smooth pursuit.

Dysfunction of striatonigral-collicular circuits lead to abnormalities of normal programming of eye-head saccades.
Saccadic EM in PD

Reflexive saccades to stimuli normal
Volitional saccades impaired
  Abnormal initiation and slow velocity
Refixaiton saccades
  Decreased amplitude, Hypometria,
  Increased saccadic latencies, Akinesia
Hypometria + Akinesia causes bradykinesia
Anti-saccades normal
Potential nigro-colliculo-reticular sites which may disrupt saccades

Frontal eye field (FEF) + sup. colliculus (SC) lesion leads to slowed small saccades

FEFs project to corpus striatum, which has major outflow via substantia nigra pars reticulata (SNPR) to SC

Cells in SNPR which modulate with saccades and project through SC may be dysfunctional

SC activates pause cells in pontine RF
PD: Eye Movements

Pursuit EM
  - Slow and fast tracking
  - Acceleration/de-acceleration

Convergence
  - Reflex EM Doll’s head and Bell’s
  - Test for a phoria as cause of diplopia
  - Alternate eye cover, distance and near
The severity of ocular motor impairment in PD correlates with the duration of the disease and the severity of bradykinesia and rigidity.
Etiology of Slow Saccades

Spinocerebellar Ataxias (SCA), especially SCA2 (olivopontocerebellar atrophy)
Huntington’s Disease
Progressive Supranuclear Palsy
Parkinson’s (advanced cases) and related diseases. Lytico-Bodig
Whipple’s Disease
Wilson’s Disease
Amyotrophic Lateral Sclerosis (some cases)
Drug intoxications: anticonvulsants, benzodiazepines
| Table 7-4: Clinical diagnostic criteria for Parkinson’s disease. |

1. Clinically probably PD, combination of any two cardinal features (including impaired postural reflexes); alternatively, any one of the first three if asymmetric. Clinically definite, any combination of three of the four cardinal features; alternatively, any two with one of the first three displaying asymmetry. Cardinal features:
   - Resting tremor
   - Lead-pipe or cogwheel rigidity
   - Bradykinesia
   - Impairment of postural reflexes (e.g., propulsion or festination)

2. Features supportive of the diagnosis include:
   - Altered axial posture, difficulty turning in bed
   - Slow, shuffling gait
   - Micrographia
   - Foot and toe dystonia
   - Masked facies
   - Soft, hesitant, or dysarthric speech
   - Decreased eye blink and blepharospasm (forced eye closure)
   - Dysphagia or drooling
   - Sleep disorders
   - Autonomic and sexual dysfunction
   - Seborrheic dermatitis

TABLE 7-3. Clinical features that distinguish dementia with Lewy bodies (DLB), Parkinson’s disease with dementia (PDD), progressive supranuclear palsy (PSP), corticobasal degeneration (CBD), and multisystem atrophy (MSA).

<table>
<thead>
<tr>
<th>Signs</th>
<th>DLB</th>
<th>PDD</th>
<th>PSP</th>
<th>CBD</th>
<th>MSA</th>
</tr>
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<tbody>
<tr>
<td>Rigidity</td>
<td>Limb &gt; axial</td>
<td>Limb &gt; axial</td>
<td>Axial &gt; limb</td>
<td>Limb &gt; axial</td>
<td>Limb &gt; axial</td>
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<tr>
<td>Asymmetric</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Posture</td>
<td>Bowed</td>
<td>Bowed</td>
<td>Extended</td>
<td>Bowed</td>
<td>Bowed</td>
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<tr>
<td>Tremor</td>
<td>+</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Falls</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Ophthalmo-paresis</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Pyramidal</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Cerebellar</td>
<td>+</td>
<td>+</td>
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<td>+</td>
<td>+++</td>
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<tr>
<td>Autonomic</td>
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<td>+</td>
<td>+</td>
<td>+++</td>
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<td>Dystonia</td>
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<td>+</td>
<td>+++</td>
<td>+</td>
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<td>Myoclonus</td>
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<td>Apraxia</td>
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<td>+</td>
<td>++</td>
<td>+++</td>
<td>+</td>
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<td>Response to levodopa</td>
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<td>+++</td>
<td>+</td>
<td>+</td>
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The following illustrations of
  The brain MRI
  Pathology of the midbrain
  Lewy body

are taken from the case of an elderly
woman with Parkinson’s Disease
Figure 1  Normal axial T2W1 through the midbrain shows the hypointense red nuclei and substantia nigra are separated by the pars compacta.
Figure 2   In a patient with PD, the Axial T2W1 shows midbrain volume loss, especially the pars compacta, as shown by “touching” red nuclei and substantia nigra

Courtesy Anne Osborn, MD
Figure 3 An autopsy in a patient with PD shows volume loss in the midbrain with pale-staining substantia nigra and decreased size of the pars compacta.
Figure 4  Section of the brain showing cytoplasmic inclusion body within a surviving neuron with an eosinophilic core surrounded by a clear halo. The Lewy body is not entirely specific, but it is a highly sensitive marker for PD.
Parkinson’s Disease

Due to dopaminergic cell death leading to dopamine deficiency

Defective gene for $\infty$ synuclein on Chr. 4q

Second locus on Chr. 2p
References
