Parkinsonism and dystonia

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What are movement disorders?

- Characterized by:
  - abnormal *voluntary* movements - or -
  - excessive *involuntary* movements
- Can have *hyper-* and *hypo-* kinetic features
- Reflect dysfunction among basal ganglia structures & between the basal ganglia, cerebellum and other CNS areas.
Organization of the basal ganglia

- Basic pathway
  - cortex → basal ganglia → thalamus → cortex
What is dystonia?
What is dystonia?

- Sustained muscle contractions with twisting postures & repetitive hyperkinetic movements

- Classified by:
  - Age of onset (young vs. adult)
  - Body distribution (focal, segmental, generalized, multifocal, hemi) and part affected
    - Cervical dystonia, blepharospasm, writer’s cramp, etc.
  - Etiology
    - Primary – genetic forms, sporadic
    - Secondary – Wilson’s disease, Parkinson’s disease, mitochondrial diseases, stroke, tumor, MS, drugs
What is dystonia?

EXAM TIPS and TRICKS

- Assess if action/task activation
- Associated with tic, tremor, myoclonus, parkinsonism?
- Is it suppressible? Sensory tricks?

Cervical dystonia
Hand dystonia
Writer’s cramp
Sensory trick

Axial dystonia
HFS
Torticollis - pre
Torticollis - post
Why the abnormal postures?

- Decreased inhibition → more facilitation
  - Malfunction in multiple brain areas – basal ganglia, cortex, brainstem, and/or cerebellum

- Inappropriate sensory integration
  - Wrong stimulation and wrong feedback
Primary medications for dystonia

- Anti-cholinergics
- Muscle relaxants
- Benzodiazepines

“The ABCs of Dystonia”
Artane – Baclofen - Clonazepam

- Botulinum toxin
What is parkinsonism?
What is parkinsonism?

- Tremor = 3 – 6 hz, rest more than action/posture
- Bradykinesia = slowed, stuttering movements
- Rigidity = cogwheeling across joints
- Postural Instability = retropulsion, inability to stop

“Houghton’s 4 S’s of parkinsonism”

Shaky, Slow, Stiff, Shuffling
What is parkinsonism?

- Tremor = 3 – 6 hz, rest more than action/posture

**EXAM TIPS and TRICKS**
- Watch for tremor closely during interview and exam
- Have patient rest forearms on thighs, dangle hands
- Tremor may enhance with distraction or mental tasks
- Tremor may “re-emerge” with action/posture
What is parkinsonism?

- Bradykinesia = slowed, stuttering movements

**EXAM TIPS and TRICKS**

- Eye movements with convergence-divergence
- Fingertaps
- Open-close hands
- Rapid alternating movements/pronation-supination
- Leg agility/heel-tap (amplitude at least 3 inches)
- Body bradykinesia
What is parkinsonism?

- **Rigidity** = cogwheeling across joints
- **Arm swing** = decreased unilateral $\rightarrow$ bilateral

**EXAM TIPS and TRICKS**

- Thumb across the biceps tendon
- Hold patient hand and rotate about elbow and wrist
- Can isolate joints
- May increase with contralateral activation (or only be subtly present then…)
- May increase after activity (i.e. walking with arm swing)
What is parkinsonism?

- Postural Instability = retropulsion, inability to stop

**EXAM TIPS and TRICKS**

- **Patient feet shoulder-width apart**
- **Pull back with across shoulders with some force**
- **Measure recovery – unaided → spontaneous**
What is parkinsonism?

Other motor features…

- stooped posture
- soft, hoarse voice
- masked face (hypomimia)
- gait festination, retropulsion
- diminished arm swing
- micrographia
- asymmetrical onset of symptoms
Non-motor features of parkinsonism

“...the sleep becomes much disturbed...”

“...constant sleepiness...and other marks of extreme exhaustion...”

“...the power of articulation is lost...”

“...saliva...trickling from the mouth...”

“...the food is with difficulty retained in the mouth...”

“...the bowels, which had been all along torpid, now, in most cases, demand stimulating medicines of very considerable power: the expulsion of the faeces from the rectum sometimes requiring mechanical aid...”
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Non-motor features of parkinsonism

Disorders of smell

Sleep disorders

Mood changes

Autonomic disorders

Memory changes

Speech disorders

Weight loss/gain

Sensory changes
Non-motor features of parkinsonism

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What is parkinsonism?

- Idiopathic Parkinson’s disease

- Atypical parkinsonian disorders
  - Progressive supranuclear palsy
  - Corticobasal degeneration
  - Multiple system atrophy
  - Dementia with Lewy bodies

- Secondary parkinsonian disorders
  - Drug-induced
  - Vascular
  - Traumatic / structural
  - Normal pressure hydrocephalus (NPH)
How common is PD?

- Average age of diagnosis = 61 years old
- Men are more common than women (3:2)
- Worldwide number of patients will likely DOUBLE over the next 20 years ~ 400,000 cases in US alone today
- Age predicts incidence
  - 1% over age 60, 10% over age 80
- Parkinson’s disease makes up about 85% of all cases of “parkinsonism”
How do we diagnose and assess PD?

- Listen to our patients!
- Recognize clinical features
  - Pre-motor, motor, non-motor
  - UK Brain Bank Criteria
  - UPDRS
- Consider mimics
- NO OTHER TESTS ARE REQUIRED
  - MRI? DaT-SPECT?
- Definitive diagnosis would require pathology…
What causes PD?

NO SINGLE KNOWN CAUSE

- Risk factors
- Protective factors
- Genetics
PD progression through Braak staging

Braak Stage 1
- dorsal motor nucleus & anterior olfactory bulb

Braak Stage 2
- lower medulla, midline raphe nucleus, locus ceruleus

Braak Stage 3  MOTOR
- substantia nigra, nucleus basalis of Meynart

Braak Stage 4 → 5 → 6
- expansion throughout neocortex
How does PD clinically progress?

Onset

Presymptomatic phase

% Remaining Dopaminergic Neurons

Sleep
Olfactory*
Mood
Autonomic system

Pre-motor

Early nonmotor symptoms

Specific symptoms

Diagnosis

Motor

Time (years)

Adapted image reprinted from Neurotherapeutics, Vol. 6, Halperin I, Morelli M, Korczyn AD, Youdim MB, Mandel SA.
How do we treat PD?

Primary symptomatic motor medications for PD

- dopamine replacement (levodopa)
- dopamine agonists
- MAO-B inhibitors
- glutamate antagonists
- COMT inhibitors
- anticholinergics
Primary symptomatic motor medications for PD

Blood-brain barrier

Periphery

COMT inhibitors

3-OMD

Ldopa

Carbidopa

Dopa

Neuron

Brain

Dopamine receptors

Ldopa

AADC

MAO-B inhibitors

COMT inhibitor

Dopamine agonists

DOPAC

3-MT
Treatment of non-motor symptoms

- Symptom-specific
- Limited high-level data
- Combinations of medication adjustments and lifestyle adjustments
- Brief discussion of common issues
  - Blood pressure fluctuations
  - Disrupted sleep
  - Cognitive impairment
  - Psychosis
Non-pharmacologic treatment

Outpatient interdisciplinary allied health team

- Comprised of:
  - PT, OT, Speech, Neuropsychologist, Social worker
  - Care partner

- Recognized role of team for treating:
  - Motor complications – rigidity, deconditioning, tremor, speech
  - Non-motor complications – drooling (speech), depression, anxiety, psychosis, constipation
  - Care partner needs – burden of disease
What’s so difficult about neuroprotection?

Multiple potential sites to “fix”…
Surgical treatment

- For patients with ET, PD, and dystonia

- “Deep brain stimulation” surgery involves placement of electrodes into the deep nuclei of the brain – typically the STN, GPi, or VIM thalamus

- Best in mid-phase of the disease
What can DBS do for PD?

1) ~ 50% improvement in motor symptoms

2) ~ 50-55% reduction in “off” time after surgery

3) ~ 70% reduction in dyskinesia after surgery

4) ~ 50-60% reduction in levodopa equivalents after surgery (STN)

5) ~ 40-50% improvement in activities of daily living scores

6) ~ 35% improvement in quality of life scores

* Best predictors of good outcome?
  - L-dopa responsiveness, longer disease duration, more disability

Thank you