Advanced Approaches for Improved Mobility in Parkinson’s Disease

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What to expect

- Overview of PD
- Overview of treatments
- Assessment
- Movement strategies
- Other treatment strategies
- Exercise research
- Exercise selection
Demographics
Is Parkinson’s is not Rare

- Involves 1% of population over age 65
- Increases with age
- By age 70: the disease occurs 120 patients per 100,000 population
- Average age of onset 62 y.o.
- Approximately up to 10% are early onset (Dx before the age of 40.)
- PD rarely seen before age 30.
What causes Parkinson’s Disease?
What is Parkinson’s Disease

- It is a progressive neurodegenerative disease.
- Characterized by movement disorder due to changes in the midbrain (Substnatia nigra)
- Automatic motor responses impaired.
PD Risk Factors

* Exposure to pesticides & herbicides
* MPTP (methyl-phenyl tetrahydopyridine)
  - synthetic narcotic related to heroin
* Chronic use of neurolyptic drugs
* Repetitive head trauma
* Rural Living
* Well Water
* Less risk in Smokers and coffee drinkers
How is diagnosis made?

- No specific standard test to diagnose
- Symptomatic & Differential Diagnosis
- Rule out other Parkinson’s like symptoms including essential tremors, progressive supranuclear palsy, multi-system atrophy, Dementia with Lewy bodies, etc.
- Disease advanced by time of diagnosis
Symptomatic Parkinson's occurs with loss of 80% of Substantia Nigra.
Substantia Nigra damage causes loss of dopamine in brain
Definition: Dopamine

- An important neurotransmitter (messenger) in the brain
- Parkinson’s disease is believed to be related to low levels of dopamine in certain parts of the brain.
Primary symptoms of PD are excessive muscle contraction resulting in rigidity (rigidity vs. spasticity).

Acetylcholine primarily stimulates muscle contraction.

Dopamine primarily reduces (dampens) muscle contraction.
Parkinson’s Disease is not for sissies!
Hallmark of Parkinson’s Disease

- Cogwheel rigidity
- Bradykinesia/Akinesia
- Abnormality of posture and gait
- Tremor
- Other: Dyskinesia, Falls
Cogwheel rigidity
Cogwheel rigidity

- Rigidity with superimposed tremor
- Ratchet-like feel
- Felt as tightness or stiffness
- Very different properties than seen in spasticity (upper motor neuron syndromes)
Bradykinesia
Bradykinesia

Several Theories

1.) Difficulty in maximizing movement speed when motor output is driven by internal control.

2.) Unable to generate adequate power/force

   \[ \text{power} = \text{work} \times \text{distance/time} \]

3.) Difficulty in changing motor set (motor plans in readiness.)
Gait Abnormality

- Loss of arm swing
- Stiff legged gait
- Leads with head and shoulders
- Festination (difficulty with initiation and termination. Shuffling style gait)
Gait
Postural Instability

- Emerges later on
- Least responsive to dopaminergic drugs
- Not usually improved following DBS
- Loss of protective reactions: cut tree falling
Retropulsion

- Tendency to fall backwards

- Strategies
  - One hand support when reaching overhead
  - Lower cabinets and close bars (closet)
  - Tai Chi stance for improve BOS (saggital plane)
Tremors

- Resting tremors
- 70% of PD cases
- Will start with one body part like toe or finger.
- Pill rolling
- Tremors reduced with purposeful activity.
FREEZING (Akinesia)

- ‘Episodic’ gait disorders- symptoms are intermittent (e.g., freezing of gait)
  - very incapacitating because individuals cannot easily adjust to the unpredictable gait problem

- Freezing of gait is associated with a high risk of falls and injuries

- Freezing of gait is independently associated with a decreased quality of life
Freezing Environmental Triggers

- Turning
- Confined Spaces
- Doorways/thresholds
- Perceived obstacles
- Floor surface changes
- Elevators
- Escalators
Turning in Parkinson's Disease

- Individuals with PD often have difficulty turning in bed and while standing.
- Turning problems may result from trouble in maintaining an interlimb connection and axial (trunk) rigidity.
  - ‘En bloc’ turning
  - Levodopa does not seem to decrease turning problems.
Definition: Dyskinesia

- Difficulty or distortion in performing voluntary movements.
- Dyskinesia can occur as a side effect of certain medications such as L-dopa and the antipsychotics.
- The word dyskinesia (dis-ki-ne´ze-a) is logically derived from two Greek roots: dys-, trouble + kinesis, movement = trouble moving.
Epidemiology of falls in Parkinson’s Disease

- It is estimated that up to 70% of Parkinson’s Disease patients fall annually
- 13% fall more than once weekly
Fractures in Parkinson’s patients

- Individuals with Parkinsonism (from any cause) have a more than two-fold increased risk of sustaining a fall-related fracture.
Risk Factors for Falls in Parkinson’s Disease

- Dyskinesias and sleep disturbances associated with dopaminergic medications
- Orthostatic hypotension
- Freezing
- Compromised posture and postural stability
Risk Factors for Falls in Parkinson’s Disease

- Impaired ambulation
- Psychological disturbances: depression and post-fall anxiety
- Compromised motor control, agility & planning of lower limbs
- Compromised lower limb strength & muscular endurance
Other Motor Signs & Symptoms

- Micrographia
- Masked Face
- Decreased eye blinking
- Hypophonia
Non-motor Complication

- **Autonomic**
  - postural hypotension
  - urinary frequency/incontinence
  - Thermal dysregulation
  - Constipation and other GI problems
  - Sialorrhea

- **Sleep problem**
  - Insomnia
  - REM behavior
  - Excessive sleepiness (side effects of meds)

- **Psychiatric**
  - Depression
  - Hallucination
  - Dementia (6 x more likely)

- **Pain**
Today’s Treatments (symptomatic)

- Medication
- Deep Brain Stimulation vs. Ablative (thalamotomy, pallidotomy)
- Future Therapies: Stem Cell, Gene Therapy, experimental drugs, supplements (creatine)
- Physical Therapy & Exercise
Medication side-effects

- Hallucinations
- Orthostatic hypotension
- Sexual dysfunction
- Sleep Disturbances
- Dyskinesia
- Depression
- Impulse control
  - Hyper sexuality
  - Gambling
Medication

ON & OFF

TIME
DBS

Deep Brain Stimulation

- Lead
- Electrode
- Terminal
- Pulse Generator

[Image: Diagram of a brain with a pulse generator connected.]

[Image: Sketch of a person wearing a device on their chest.]
When do we refer patient to DBS surgery?

- Motor Fluctuation
- Surgery will help prolong patients “BEST ON STATE” on meds, decrease OFF time
- Cannot usually make ON better
- Can help reduce medication
When Should Activa DBS Therapy be Considered?

- When, despite optimized pharmacotherapy, your patient experiences **troubling motor symptoms**, which may include:
  - Wearing off – Off periods that contain troubling bradykinesia, rigidity, tremor, and/or gait difficulty
  - Troubling dyskinesia
  - Motor fluctuations
  - Refractory tremor
Additional Benefits of Activa DBS Therapy

- Bilateral, reversible, and adjustable
- Non-destructive versus ablative procedures
- Can be non-invasively fine-tuned to each patient’s individual needs
Non-pharmacological treatment

- Physical Therapy - Movement Strategies
- Exercise
PHYSICAL THERAPY

- Early Intervention should always be the focus.

- Rationale for therapy
  - Education on Movement Strategies
  - Increase ROM
  - Improve co-ordination of movement
  - Improve/maintain posture and functional abilities.
  - To prevent secondary sequelae
  - TO MINIMIZE FALLS!
Treatment Focus

- Movement Strategies
- Posture
- Exercise (Life sentence)
PT Treatment: Movement Strategies

- No more automatic pilot/ Purposeful movement
- Conscious posture/darn that gravity
- Blending/sequential movement
- Freezing/external cues/anti-freezing techniques
- Festination (PD gait)/walking strategies
No more automatic pilot

- Prior to PD you did not have to think to move.
- The automatic pilot does not always work especially during wearing off (off periods) of medications.
- During off periods, you need to turn off the faulty automatic pilot and fly the plane manually!
Purposeful Movement

- Ability to move is not lost

- Basal Ganglia is responsible for automatic motion in learned motor tasks

- Bypass the depleted basal ganglia and use fronto-cortico-limbic pathways instead (requires conscious thought)
No more automatic pilot/
Purposeful movement

- Visualize
- Plan
- Sequence (one step at a time)
- Complete
Blending Movements

No More Multi-Tasking
STAY IN THE MOMENT

TURN YOUR PATIENTS INTO MENTAL SURFERS
Blending movement
Sequential movement

One step at a time. Complete each step.
Manual flying applied to walking

- Focus on a target down the road.
- Keep stringing targets together to avoid stopping/freezing.
"Your back will tell you that Sister Anne Marie was right."
Conscious posture/darn that gravity
Poor Posture = Poor Function

- Sit posture drill (decrease ADLs) (Dressing, etc.)
- Promotes freezing/festination (COG in front of base of support)
- Promotes retropulsion (Inclines, reaching overhead)
Typical PD Posture
Freezing/external cues/anti-freezing techniques

- Initiating Movement (poor man’s hula)
External Cues

- Attention - conscious movement
- Auditory - Rhythm
- Visual - Marker/target
- Tactile - Sensory Stimulation
External cues

- Visual: Imaginary Line, tape, laser
- Auditory: Talking to self, counting
- Focus on a target/destination
- External focus vs. Internal focus (study)
Anti- Freezing Strategies

- Stop when freezing occurs. Do not attempt to move through it as it often leads to loss of balance.

- Restart movement with a purposeful step (*See Poor Man’s Hula*).

- Visualize stepping over an imaginary object.

- If doorways and elevators are a problem, try to look past the threshold focusing on where you want to go to versus the threshold itself.

- See what tricks work for you and practice these strategies. Having done this may decrease anxiety lessening the “freezing affect”.
Walking Strategies

- Four Point Gait
Walking Strategies

“The British Soldier”
Walking Strategies

- Heel First
Fall Prevention Strategy

Arms up
Assistive Devices

- Balance & Posture vs. Off-loading
- Stability vs. Mobility
Specialty Devices

- U-Step Walker (Laser)
Specialty Devices

- Next Step Cane
Captain Cheapo
Walking Poles

- Nordic poles or wooden sticks
MOVE IT!

An Exercise and Movement Guide for Parkinson’s Disease
Exercise DVD/Book

- MOVE IT!

- [www.parkinsonsmoveit.com](http://www.parkinsonsmoveit.com) or available on Amazon.com
THE END
QUESTIONS