Assessment of Gait Abnormalities in Individuals with Parkinson’s Disease With and Without Suspected Cholinergic Deficits

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INTRODUCTION

- Parkinson’s disease (PD) is a neurodegenerative disorder associated with the reduction of dopamine in the basal ganglia, characterized by a clinical spectrum of motor and non-motor presentations.
- Differences in cholinergic system degeneration may explain some of the clinical variations seen in patients with PD.
- The specific features of cholinergic degeneration seen in PD are impaired cognition, slower gait speed, falling, rapid eye movement sleep behavior disorder (RBD), and impaired olfaction.

PURPOSE

- The motivation of this study was to test whether or not cholinergic system degeneration, in addition to basal ganglia deficits, contributes to varying gait deficits seen in PD.
- The primary hypothesis of this study is that patients with PD explain some of the clinical variations seen in the patient’s electronic medical record.

METHODS

- Design: Observational, cross-sectional study performed in a movement disorders clinic in an urban setting, recruiting sequential patients.
- Study population:
  - Goal: To recruit 200 participants for a 10% representative sample of the Parkinson’s patients seen in the Emory Movement Disorders Clinic.
  - Inclusion criteria for enrollment:
    - Diagnosis of idiopathic PD or other parkinsonian syndromes
    - Ability to provide informed consent in English
  - Exclusion criteria for gait assessment:
    - Lower extremity weight bearing restriction
    - Lower extremity botulinum toxin in previous 3 months
    - Safety concerns with ambulation

- Enrollment: Patients were invited for participation by their physician. Patients who met the inclusion criteria provided informed consent before undergoing a brief clinical interview.
- Patient anthropometrics, including hip width and leg length, were taken in order to normalize gait data.

METHODS

- Participants were assessed for clinical study variables during a brief interview.
- Height, weight, fall history, amount of school completed, overall self-assessed mobility and health, joint pain, and the presence of RBD were all reported subjectively.
- A separate member of the study staff obtained further demographic information from the patient’s electronic medical record.

Gait Testing

- Eligible patients underwent gait testing on a pressure-sensitive walkway.
- The gait assessment consisted of walking 25 feet along one side of the mat, turning around a cone, and walking back to the starting end of the mat.
- Each participant completed a trial turning clockwise and counterclockwise to account for the presence of lateralized symptoms.
- Patient instructions:
  - Walk at a comfortable pace
  - Remain silent during testing
  - Use an assistive device if needed for safe ambulation

RESULTS & DISCUSSION

- Of the 147 individuals that underwent gait analysis, 37 were classified as suspected hypocholinergic and 115 were classified as suspected normocholinergic based on a brief clinical screen derived from the literature.
- After interim univariate analyses, we found that the presence of suspected cholinergic deficits was associated with an ≈11% decrease in normalized gait speed, an ≈8% decrease in normalized step length, and negligible increase in stride width.
- Clinicians can use a quick clinical screen, without interrupting facility workflow, to determine suspected cholinergic deficits.

LIMITATIONS

- Potential overestimation of refusal rate due to communication with clinic physicians
- Inter-rater reliability may be affected due to 10+ study staff
- Gait data collected in a potentially distracting environment
- Potential misclassification bias due to the possibility of overestimating number of patients as normocholinergic, which could increase variance
- Safety concerns with ambulation

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REFERENCES