

AMPLIFICATION OF FALL RISK IN PARKINSON'S DISEASE: THE INFLUENCE OF COMORBIDITIES

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Long term studies examining the progression of Parkinson's disease (PD) report the mean age of diagnosis to be in the mid sixties.¹ The diagnosis of PD typically occurs after the presentation of motor deficits such as resting tremor, rigidity, hypokinesia, or postural instability.² Parkinson's disease in isolation results in worsening of motor deficits and progressive functional decline. While these problems are primarily the result of the degenerative process, underlying comorbidities may amplify or contribute to these deficits. In addition, given the typical age of onset, persons with PD will often present with a host of concurrent medical conditions (comorbidities). This is confirmed by research that estimated over 50% of Medicare beneficiaries had multiple comorbidities at the turn of the century.³

The consequences of comorbidities include, but are not limited to, impaired mobility, depression, reduced quality of life, and increased health care expenditures relative to cohorts without comorbidities.⁴ In an on-going longitudinal study, we have demonstrated that the majority of persons with PD have one or more comorbidities, and that the accumulation of these comorbidities is related to a decline in gait, balance, and quality of life as well as an increase in disease severity as measured by the Movement Disorders Society Unified PD Rating Scale (UPDRS).

While the overall number of diagnoses appears to have some influence on mobility, balance, and overall quality of life, the relationship is only of moderate strength. In our clinical experience, the specific type of comorbidity present has a profound impact on mobility and balance function in persons with PD.⁵ While this observation has yet to be directly examined in research studies, based on related evidence, we feel it is critical for physical therapists (PTs) to focus on

PD as well as the non-neurologic medical history of their clients. To illustrate the importance of this issue, we present two clinical cases of comorbidities with particular relevance to mobility and balance in one person with PD with urinary incontinence (case 1) and another person with PD with peripheral neuropathy (case 2).

Case 1: Urinary Incontinence

Lower urinary tract dysfunction may be present in many individuals with PD. The presence of this dysfunction may arise from alteration of peripheral urologic structures (for example from prostate surgery in males or from child birth in females) or from autonomic disturbances associated directly with the neurologic problems of PD. Urge urinary incontinence (UI), the complaint of involuntary leakage accompanied by or immediately preceded by urgency, occurs in 25% to 28% of persons with PD^{6,7} and can be seen early in the course of PD.

While urge UI is certainly a social concern for individuals experiencing it, it also appears to be an independent risk factor for falls in neurologically healthy individuals and those with PD. In women without PD that experienced at least one urge UI episode each week, fall risk was increased 26% and the risk of fractures was increased 34%. In persons with PD, urinary incontinence increased the probability of falling by almost 6 times (adjusted OR = 5.9, 95% CI: 1.4-24.6).⁸ Regardless of the presence of a neurologic diagnosis such as PD, urinary frequency, nocturia, and rushing to the bathroom to avoid urinary incontinence have all been hypothesized to increase fall risk.⁹

The initial referral for client 1 (Male; age: 78 years; Hoehn and Yahr stage: 3; UPDRS motor subsection: 11; history of falls: >5 in the past year) (Table) came

from his neurologist with the diagnoses of PD and UI with a request to evaluate and treat for increasing balance problems and fall occurrences. Client 1 had been diagnosed with PD for 16 years prior to the referral to PT and he was currently taking dopamine replacement medications (Sinemet 6 times per day). In addition to PD, client 1's non-neurologic medical history was significant for a transurethral resection of the prostate for benign prostatic hypertrophy. Clinical examinations of balance and mobility were performed using the Functional Gait Assessment (FGA), Timed Up and Go (TUG), and Six Minute Walk (6MW). Outcomes of these examinations are presented in the Table. Further questioning regarding his fall history revealed multiple near falls or falls during efforts to get to the bathroom. History of incontinence episodes were only elicited following explicit questions targeted at UI ("Do you experience such a strong and sudden urge to void that you leak before reaching the toilet?").¹⁰ Client 1 reported a frequency of UI occurrences 4 times per day and a frequency of voiding every 50 minutes.

After findings consistent with urge UI, client 1 was referred to a urologist for medical evaluation. Urologic examination confirmed the diagnosis of urge UI and client 1 was referred back to physical therapy. The initial treatment involved combined fall risk reduction interventions and education on home pelvic floor muscle training. Although pelvic floor muscle training is an effective treatment for urge urinary incontinence,^{11,12} client 1 experienced only a moderate reduction in UI episodes as a result of the training. It was hypothesized that the reduced efficacy relative to neurologically healthy individuals was due to the autonomic dysfunction associated with PD. Treatment strategies targeted at fall reduction included practice of compensatory step-

Table. Demographics and Clinical Examination Findings.

	Age/gender	Years w/ PD	H&Y	UPDRS	History of Falls (per yr.)	FGA	TUG (sec)	6MW (m)
Client 1 (PD and UI)	78/M	16	3	11	>5/year	26	7.2	484.80
Client 2 (PD and PN)	76/M	6	3	26	>10/year	17	16.77	452.48

ping, practice of balance challenges in altered sensory situations, and education about the adverse effect of urinary urgency on his fall risk. Most importantly, client 1 did experience a reduction in his self-reported near fall and fall frequency in response to therapy.

Case 2: Peripheral Neuropathy

Individuals with lower extremity peripheral neuropathy (PN) experience similar fall related risks as those with PD.¹³ In both disease processes sensory integration is affected¹⁴ resulting in increased reliance on other sensory stimulus such as vision.¹⁵ In addition, authors have postulated that the diminished sensory integration is caused by impaired proprioception.¹⁶ While sensory integration has been shown to play an important role in postural stability, to our knowledge there are no reports in the literature documenting the effects of peripheral sensory deficits in persons with PD in regards to balance and mobility. Despite this lack of research evidence, in our clinical experience, the sensory deficits associated with PN interact with the sensory integration and motor deficits associated with PD to create profound fall risk above and beyond that which could be ascribed to PD alone.

The initial prescription from his treating neurologist was a diagnosis of PD and the request to evaluate and treat. Client 2 had been diagnosed with PD 6 years prior to the referral to PT, and he was currently taking dopamine replacement medications (Sinemet 4 times per day) as well as a dopamine agonist. The mobility and fall history was significant for almost daily near falls and greater than 10 falls in the past year. In addition to PD, client 2 reported a diagnosis of idiopathic neuropathy that primarily affected his distal lower extremities. His PD and fall history were as follows. (Male; age: 76 years; Hoehn and Yahr stage: 3; UPDRS motor subsection: 26; history of falls: >10 in the past year) (Table). Sensory testing revealed moderately impaired light touch and sharp/dull sensation inferior to the bilateral

malleoli. Following sensory testing, clinical examinations of balance and mobility were performed using the FGA, TUG, and 6MW while on his medications. Performance on the FGA, TUG, and 6MW were severely affected (Table). When considered relative to published PD specific fall risk cut-off scores for the TUG,¹⁷ his performance reflected a profound fall risk even when on medications. Furthermore, FGA scores were significantly lower when compared to scores for similar aged healthy elderly (70-79 y/o: 24.9).¹⁸ During FGA testing, client 2 manifested particular difficulty with items that required reductions or alterations in visual or vestibular function (eyes closed, head turns will walking).

Based on his examination findings, the clinical hypothesis was that this client's poor balance performance and fall risk were due to the interaction of impaired ankle somatosensation with the motor deficits consistent with PD. Treatment strategies targeted at fall reduction were implemented and included lower extremity strengthening, use of vision as a compensation for lower extremity sensory deficits, and practice of balance challenges in altered sensory situations. Given the irreversible nature of his PN, a large component of treatment involved education of the client and his caregiver regarding the use of an assistive device (a 4-wheeled walker with brakes) and the need for guarding during balance challenges. In addition, floor to chair/floor to stand transfer training was initiated to confirm independence and insure that the client would not be stranded once he had fallen. Unfortunately, client 2 did not experience improvements in his clinical balance test performance over the course of treatment. However there was a mild reduction in his self-reported near fall and fall frequency. The client and caregiver attributed this reduction to the assistive device and guarding.

DISCUSSION

The diagnosis of PD alone carries an increased risk for falls and fall related injury. However, the mobility and balance performance of persons with PD is gen-

erally heterogeneous and therefore it is unclear what characteristics beyond PD amplify a persons balance and mobility deficits. In the presented cases, we summarize the clinical findings of two persons with specific comorbidities, which in our experience are particularly relevant to PTs treating persons with PD. These cases vividly illustrate the potential amplification of balance and mobility deficits in the context of PD with either urinary incontinence or peripheral neuropathy.

CLINICAL RELEVANCE AND CONCLUSIONS

As part of the examination process, PTs must consider the effect of co-morbidities on motor deficits such as gait and balance. Physical therapists examining persons with concurrent PD and UI or PN should anticipate the potential for repetitive falls and plan treatment accordingly. Only with treatments addressed at their Parkinsonian deficits as well as their co-morbidities will fall risk reduction treatment be optimized.

While both types of co-morbidities may worsen function, the origin of their effect appears to be different. The threat of UI will often induce rushing to the bathroom, which in the context of PD may produce freezing or tripping. The near fall or fall events in individuals with PD and UI may be reversible with the implementation of a regular voiding schedule and pelvic floor muscle training. In contrast, PN in the context of PD, creates a sensory motor situation that may be a "recipe for disaster." Persons with PD and PN may not improve their balance performance in response to treatment. However, reductions in fall risk may be achieved through the use of assistive devices and client and caregiver training.

The objective of this paper was to raise the awareness of PTs regarding factors that may amplify fall risk in persons with PD. The cases presented provide only observations of the interaction of PD with comorbidities. Further research is needed to determine the effects of comorbidities on selective aspects of balance and mobility function as well as the effects of co-

morbidity management in conjunction with PD rehabilitation.

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CANDIDATES FOR 2010 SOG ELECTION

The Section on Geriatrics is pleased to announce candidates for 2010 elections. Candidate statements will appear in the September issue of *GeriNotes* with electronic voting to follow in October. The Nominating Committee would like to thank all candidates for their willingness to serve.

Nominating Committee

Carol Schunk, Chair
Rita Wong
Kathy Brewer

SECRETARY

Greg Hartley
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NOMINATING COMMITTEE

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DELEGATE

Cathy Ciolek

Andrea Saevoon, SOG Section Executive, resigned her position effective July 2nd. Andrea plans to attend graduate school for a Master of Social Work which has been her professional goal. As Section Executive Andrea's responsibilities have been varied, but she has always been helpful and cheerful in assisting the SOG Board and members to the benefit of the Section. Thank you and best of luck to Andrea in this new passage of her life.