

Fear of falling has greater influence than other aspects of gait disorders on quality of life in patients with Parkinson's disease

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Abstract

We assessed the influence of gait disorders (GD) on quality of life (QOL) in Parkinson's disease (PD). In a survey including the PDQ-39 and a new 8-item questionnaire of GD (8-QGD), 491 PD patients estimated their gait at the worst state, the effect of their GD on activities of daily living, compared the severity of GD with the other PD symptoms, evaluated the occurrence of freezing of gait (FOG), levodopa-resistant FOG, falls, activity limitation due to fear of falling (FOF), and the occurrence of injuries. Significant differences in PDQ-39 scores were found between three groups of patients divided with respect to the severity of GD. Linear multiple regression analysis showed that FOF had the highest impact on PDQ-39 scores ($r=0.32$, $p<0.001$). These results confirm that GD have a substantial impact upon the QOL in PD and suggest that FOF plays a major role in QOL deterioration.

INTRODUCTION

Parkinson's disease (PD) is a chronic neurodegenerative disease with a substantial impact on health-related quality of life (QOL). Notably, PD has a greater impact on QOL compared to other chronic diseases such as diabetes mellitus (Karlsen *et al.* 1998), coronary heart disease or arthritis (Gage *et al.* 2003).

Gait disorders (GD) and postural instability are common symptoms in patients with PD and often affect their activities of daily living (ADL). Along with disease severity and non-motor symptoms such as cognitive impairment and depression, postural instability and GD were found to be the main variables affecting QOL (Rahman *et al.* 2008;

Gomez-Esteban *et al.* 2007; Schrag *et al.* 2000). Especially, freezing of gait (FOG) can greatly influence the QOL of PD patients (Moore *et al.* 2007). In a retrospective analysis of the DATATOP study patient cohort, worsening gait and balance were the only variables accompanied by worsening QOL (Marras *et al.* 2008). However, this finding was based only on the relatively limited information provided by the 4-item Postural Instability Gait Disorder subscore of the UPDRS.

The aim of our study was to evaluate in more detail the influence of different aspects of GD such as freezing, fear of falling (FOF), falls and related injuries on QOL among PD patients and to deter-

mine which of these factors play the most important roles in QOL deterioration in PD.

PATIENTS AND METHODS

We mailed a set of questionnaires to all 683 patients with PD that were seen in the Prague Movement Disorders Center between June 2006 and February 2007. The study was approved by the local research ethics committee. All subjects provided a written informed consent.

The set contained the PD questionnaire for assessment of health-related quality of life (PDQ-39) and a newly conceived 8-item questionnaire on gait disorders in PD (8-QGD). This investigational tool was constructed with the aim to analyze in more detail the influence of various aspects of GD on QOL. Questions number 1, 2 and 4 were adopted from Freezing of gait questionnaire (Giladi *et al.* 2000), number 6 and 7 from Gait and balance scale (Thomas *et al.* 2004). Patients were required to respond to each of the 8-items by choosing one out of five possible responses scored from zero to four, with zero representing normal performance and four denoting the greatest level of impairment (Appendix 1). The patients estimated their gait at their worst stage (Item 1); the effect of their GD on ADL (Item 2), and compared the severity of their GD with other motor symptoms of PD (Item 3). The remaining 5 items of the questionnaire evaluated the occurrence of phenomena such as FOG (Item 4), levodopa-resistant FOG in the "on" state (Item 5), falls (Item 6), the degree to which the patients' activity is limited due to FOF (Item 7) and the occurrence of injuries (Item 8).

Based on the responses to the first three items of 8-QGD, distribution of the responders into three groups according to the severity of GD was designed as follows: Group 1 (GD1) contained patients with no or minimal GD (scoring no more than 1 in any of items 1–3). Group 2 (GD2); included patients with moderate GD (scoring 2 in any of items 1–3). Group 3 (GD3) contained patients with severe GD (scoring higher than 2 in any of items 1–3).

The intergroup differences in the PDQ-39 scores were analyzed using the nonparametric Jonckheere-Terpstra test. A linear multiple regression analysis was employed to study the relationship between GD phenomena and QOL in PD patients.

RESULTS

The response rate among the 683 PD patients was 75% (512), with 72% (491) remaining after the exclusion of incomplete answers. The analysis included 290 (59%) males and 201 females of mean age 66.7 years (SD 9.4, range 43–89) and mean PD duration 10 years (SD 6, range 1–32).

According to the first three items of 8-QGD, 105 patients ranked in the group GD1, 136 in GD2 and 250 in the group GD3. Hence 386 of 491 (79%) patients ranked to GD2–3 groups representing moderate to severe GD. The mean PDQ score was 18.8 in GD1; 31.2 in GD2 and 44.2 in GD3. Between the groups GD1 and GD3, as well as between GD2 and GD3, significant differences were identified in the total PDQ-39 score ($p < 0.001$) as well as in all its subdimensions. Between the GD1 and GD2 groups, significant differences were found in the total score and in all PDQ-39 subdimensions except *Social support* (Table 1).

The responses to 8-QGD items 4–8 revealed that 347 out of 491 (71%) patients experienced FOG, whereas 281 (57%) had at least rare experience with levodopa resistant FOG in the "on" state. Falls were reported by 285 (58%) patients, with 76 (15%) suffering more than one fall a week, and 240 (49%) patients reported injuries due to falls. Though 343 (70%) patients stated some degree of limitation due to FOF.

Multiple regression analysis evaluating the impact of individual aspects of GD (8-QGD items 4–8) to QOL showed a highly significant relationship between FOF and PDQ-39 total score ($r = 0.32$, $p < 0.001$) as well as between "On" freezing ($r = 0.27$, $p = 0.001$) and PDQ-39. Less powerful, but still significant, was the relationship between falls and PDQ-39 ($r = 0.15$, $p = 0.006$). Other factors did not significantly affect PDQ-39 total scores (Table 2).

Table 1. Means of total score and subscores of PDQ-39 with regard to the severity of gait disorder in PD patients.

	Mobility	ADL	Emotional wellbeing	Stigma	Social support	Cognition	Communication	Bodily discomfort	PDQ-39 total score
GD1 (105 patients)	12.1	17.3	21.9	23.1	10.0	21.8	15.2	29.0	18.8
GD2 (136 patients)	36.0 ^a	33.7 ^a	32.0 ^a	31.5 ^a	13.7	31.3 ^a	28.6 ^a	42.5 ^a	31.2 ^a
GD3 (250 patients)	64.3 ^{ab}	54.2 ^{ab}	42.8 ^{ab}	38.5 ^a	23.0 ^{ab}	39.8 ^{ab}	38.3 ^{ab}	52.5 ^{ab}	44.2 ^{ab}

^a Significantly ($p < 0.01$) different from GD1

^b Significantly ($p < 0.01$) different from GD2

PD, Parkinson's disease; PDQ-39, Parkinson's disease quality of life questionnaire; ADL, Activity of daily living; GD, gait disorder; GD1, patients with no or minimal GD; GD2, patients with moderate GD; GD3, patients with severe GD.

Table 2. Standardized regression coefficients, intercept and R-squared of gait disorder symptoms on dimensions of PDQ39 (Significance of the regression coefficient in brackets).

PDQ-39	Mobility	ADL	Emotional wellbeing	Stigma	Social support	Cognition	Communication	Bodily discomfort	PDQ-39 total score
8-QGD									
FOG	.10 (.112)	.11 (.153)	-.10 (.303)	.04 (.719)	-.01 (.934)	-.33 (.000)	.07 (.472)	.09 (.407)	-.02 (.757)
FOG "on"	.09 (.142)	.17 (.039)	.23 (.024)	.18 (.112)	.13 (.259)	.39 (.000)	.09 (.363)	.14 (.201)	.27 (.001)
falls	.01 (.756)	.07 (.191)	.12 (.079)	.00 (.976)	.16 (.034)	.19 (.004)	.37 (.000)	-.03 (.646)	.15 (.006)
FOF	.56 (.000)	.39 (.000)	.11 (.124)	.10 (.216)	-.04 (.596)	.34 (.000)	.10 (.137)	.12 (.094)	.32 (.000)
injuries	.16 (.000)	.05 (.231)	.21 (.001)	-.00 (.962)	.10 (.153)	-.06 (.348)	-.09 (.178)	.17 (.010)	.10 (.057)
intercept	45.30 (.000)	40.66 (.000)	35.38 (.000)	33.32 (.000)	17.66 (.000)	33.66 (.000)	30.66 (.000)	44.78 (.000)	35.18 (.000)
R-squared	0.71	0.52	0.25	0.09	0.09	0.27	0.27	0.18	0.52

PDQ-39, Parkinson's disease quality of life questionnaire; 8-QGD, 8-item questionnaire of gait disorder; ADL, Activity of daily living; FOG, freezing of gait; FOG "on", levodopa resistant freezing of gait; FOF, fear of falling.

DISCUSSION

Moderate to severe GD were frequent in our group of PD patients, affecting 79%. Other way round, only 21% of patients were free of GD, including those in GD1 group stating minimal impairment that could yet be attributed to normal age-related cautious gait. Similarly, in a previous study 75% of patients with PD of more than 5 years duration suffered from GD (Schrag *et al.* 2002). Our results further show that the QOL was considerably decreased in patients with severe GD compared to moderate GD, and even in patients suffering from moderate GD, compared to those with no or minimal GD. The intergroup differences concerned all subdimensions of PDQ-39, not only an expected influence of GD on *Mobility* and *ADL* but including also a significant association with the dimensions of *Emotional wellbeing*, *Cognition*, *Communication* and *Bodily discomfort*.

FOF appeared to have the highest impact on QOL, even greater than falls themselves. The inverse relationship between FOF and QOL in PD was previously described in a sporadic study (Franchignoni *et al.* 2005), but FOF has not been routinely regarded as a factor of QOL deterioration in PD. Indeed, in comparison to other aspects of GD, FOF does not have episodic character so that it can permanently influence the patient's behavior and cause significant activity restrictions. FOF was found to be associated with an altered postural control (Adkin *et al.* 2003) and it was identified

as a predictor for falls among PD patients reporting no falls in the previous year (Pickering *et al.* 2007). Furthermore, it was demonstrated that an estimate of FOF can help to predict postural instability in PD patients (Adkin *et al.* 2003) and a simple scale was suggested for its assessment (Peretz *et al.* 2006). Beyond the expected relationship with mobility and ADL, FOF had a high association to cognition subscore of PDQ-39 in our patients. Accordingly, a relationship between balance, gait, and cognitive impairment was described in elderly fallers who reported FOF (Vellas *et al.* 1997).

Levodopa-resistant "On"-freezing had also a high influence on QOL. Patients with advanced PD adjust their behavior to their actual motor state and tend to perform activities only in the "On" state. For them, the occurrence of unexpected and unpredictable "On" freezing could be a very debilitating experience. This is probably the reason why in our comparison the "On" freezing was found as a more significant factor than simple FOG, with its previously established influence on QOL in PD patients (Moore *et al.* 2007).

Finally, the impact of falls on QOL is not surprising and it was shown previously (Rahman *et al.* 2008). Falls can subsequently induce FOF in PD (Bloem *et al.* 2001) and further worsen overall QOL.

The present study has an important limitation. It is based on self-administered questionnaires while the severity of GD was not objectively evaluated. On the other hand, the data about FOF, occurrence of falls and injuries are always dependent on patients provided

information. So we believe that within its limits, this study indicates a substantial influence of FOF upon the QOL in a large cohort of PD patients.

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Evžen Růžička – Conception of research project, review and critique of statistical analyses, review and critique of the manuscript.

APPENDIX 1.

Questionnaire of gait disorders in Parkinson's disease (8-QGD)

1. During your worst state - Do you walk:

- 0 Normally
- 1 Almost normally—somewhat slow
- 2 Slow but fully independent
- 3 Need assistance or walking aid
- 4 Unable to walk

2. Are your gait difficulties affecting your daily activities? and independence?

- 0 Not at all
- 1 Mildly
- 2 Moderately
- 3 Severely
- 4 Unable to walk

3. Ambulation

- 0 Normal
- 1 Minimal difficulties compared to other motor impairment
- 2 Difficulties similar to the other motor impairment
- 3 More prominent gait disorder compared to other motor impairment
- 4 Gait disorder is a major motor impairment

4. Do you – feel that your feet get glued to the floor while walking, making a turn or when trying to initiate walking? (freezing)?

- 0 Never
- 1 Rare – about 1 per month
- 2 Occasionally – 1 per week
- 3 Often about 1 per day
- 4 Most of the time

5. Do you have an experience with freezing even in your best state?

- 0 Never
- 1 Rare
- 2 Occasionally
- 3 Often
- 4 Always, the experience with freezing is similar in the best and the worse state

6. How often do you fall?

- 0 No falls
- 1 Rare falls (<1 per month)
- 2 Falls \geq 1 per month
- 3 Falls \geq 1 per week
- 4 Falls \geq per day

7. Limitation of activities due to fear of falling

- 0 No limitation
- 1 Able to ambulate independently but with caution
- 2 Usually hold on during walking, shower, or dressing
- 3 Rarely ventures outside the house, because of fear of falling
- 4 Does not even attempt to stand or walk because of fear of falling

8. Have you hurt yourself by falling?

- 0 Never - no injuries
- 1 Minor injuries - not requiring medical treatment
- 2 Injuries requiring medical treatment
- 3 Injuries requiring hospitalization
- 4 Injuries requiring hospitalization, without full recovery