Original Paper

European Neurology

Eur Neurol 2007;57:161–165
DOI: 10.1159/000098468

Received: April 26, 2006
Accepted: October 30, 2006
Published online: January 10, 2007

Influence of Motor Symptoms upon the Quality of Life of Patients with Parkinson's Disease

J.C. Gómez-Esteban J.J. Zarranz E. Lezcano B. Tijero A. Luna F. Velasco
I. Rouco I. Garamendi

Neurology Service, Movement Disorders Unit, Hospital of Cruces, Baracaldo, and Neurosciences Department, Basque Country University, Bilbao, Spain

Abstract

We studied the impact of various motor and nonmotor symptoms upon quality of life in patients with Parkinson's disease (PD). The study comprised 110 patients with PD (age: 68.6 years, course of the disease: 7.6 years). The Unified Parkinson Disease Rating Scale (UPDRS; I–IV) and Parkinson's Disease Questionnaire (PDQ-39) were recorded. We recorded the correlations between years of disease and UPDRS IV, as well as PDQ-39 and UPDRS I, II, III and IV. Introduction of all variables into a linear regression model showed that 3 variables accounted for 51% of the variance in PDQ-39. Mental condition, gait disorders and complications of dopaminergic drugs are the variables that most affect the quality of life of patients with PD.

Introduction

The aim of therapy in patients with incurable chronic disorders such as Parkinson's disease (PD) is to improve their quality of life [1]. Quality of life assessment in PD is an important and expanding area, with a promising application in clinical trials and pharmacoeconomics [2, 3]. The Parkinson's Disease Questionnaire (PDQ-39) [4] has been shown to be useful and effective in quantifying quality of life specifically in patients with PD. However, such scales must be validated in different languages, since their simple translation does not ensure adequate reproducibility [5]. Other health-related quality-of-life scales have been used in PD. These scales correlate well with measurements of disease severity and quality of life. However, they give strikingly different values. These discrepancies lead to difficulty in their effective application in clinical practice [6]. To date, clinicians have used scales that fundamentally assess motor aspects of PD in order to quantify clinical improvement as a result of different therapies. This is the case for example of the Unified Parkinson Disease Rating Scale (UPDRS) [7]. Our hypothesis is that this questionnaire contains various items of importance for patient quality of life, such as altered gait, that are not sufficiently addressed by the UPDRS [8]. In this context, 2 patients with the same UPDRS score may nevertheless exhibit important differences in quality of life depending on the predominant symptomatology.

The aim of the present study is to assess the true impact of motor symptoms upon quality of life in patients with PD. An evaluation of the influence of the mental condition, pharmacological treatment and its complications, and the course of the disease in years upon patient quality of life was also made.

KARGER

Fax +41 61 306 12 34
E-Mail karger@karger.ch
www.karger.com

0014–3022/07/0573–0161$23.50/0

Accessible online at:
www.karger.com/ene

Juan Carlos Gómez Esteban
Servicio de Neurología
Hospital de Cruces, Plaza de cruces s/n
ES–48903 Baracaldo (Spain)
E-Mail jgomeze@meditex.es

Patients and Methods

A cross-sectional study was designed involving 110 patients (53 males and 57 females). All presented PD based on the criteria of the London Brain Bank [9]. The mean patient age was 68.6 ± 9.2 years, with a time since diagnosis of the disease of 7.6 ± 4.7 years. Prior to the interview, the patients were given a detailed explanation of the purpose of the study, with the guarantee of confidentiality of the data obtained. Verbal informed consent was required in all cases. Patients with suspected atypical parkinsonism were excluded from the study.

The following data were recorded: date of birth, sex, onset of PD, years of treatment with levodopa, type of dopaminergic drugs used and the corresponding dosing regimens. The equivalent dose of levodopa was calculated according to the equivalences currently in use with the different dopaminergic drugs (100 mg of levodopa: 6 mg ropinirole, 0.7 mg pramipexole, 1 mg pergolide, 10 mg bromocriptine, 1 mg lisuride, 1.5 mg cabergoline and 100 mg amantadine). Afterwards the patient's mental condition was assessed (UPDRS I), along with daily life activities (UPDRS II), motor condition (UPDRS III) and the complications of the different dopaminergic drugs (UPDRS IV). We grouped the following items: resting tremor in the 4 limbs (20r + 20l + 21r + 21l), rigidity in the 4 limbs (item 22, score 0–16) and the different items that measure bradykinesia – separating upper (23r + 23l + 24r + 24l + 25r + 25l) from lower limb involvement (26r + 26l). Scorings of the different dimensions measured by PDQ-39 and PDQ-39 summary index were recorded.

Statistical Analysis

For each numerical variable we calculated the mean, standard deviation (SD) and 95% confidence interval. Normality and homogeneity of the variances were confirmed with the Kolmogorov-Smirnov and Levène tests, respectively. We then established bivariate correlations using Pearson correlation coefficients. With the PDQ-39 score as dependent variable, a stepwise linear regression model was developed in which we initially included all the independent variables presenting correlations that proved significant both statistically ($p < 0.001$) and in terms of magnitude (correlation coefficient, $r > 0.4$). Finally, correlations were established (Pearson correlation coefficients) between the variables included in the model and the different dimensions comprising the PDQ-39.

The SPSS© version 12 statistical package (SPSS Inc., Chicago, Ill., USA) was used throughout.

Results

Nine out of the 110 patients were not receiving dopaminergic treatment (1 patient was taking selegiline alone), while 31 were being administered levodopa as monotherapy (6 combined standard levodopa with sustained-release formulations). The remaining 70 patients were receiving dopaminergic agonists: 13 patients as monotherapy and 57 in combination with levodopa. The mean equivalent dose of levodopa for all the patients was 637.22 ± 461.91 mg.

Table 1. Scores corresponding to the different dimensions of the PDQ-39 scale

Dimensions	Mean
Mobility	11.44 (9.20)
Daily life activities	6.50 (4.73)
Mood state	7.23 (4.69)
Social stigma	4.21 (4.66)
Social support	1.23 (2.37)
Cognitive condition	4.04 (2.93)
Communication	2.91 (3.35)
Body discomfort	4.25 (2.37)
PDQ-39 summary index	41.27 (20.73)

Figures in parentheses represent SD.

Table 2. Scores corresponding to the UPDRS I–IV

	n	Minimum	Maximum	Mean	SD
UPDRS I	110	0.00	11.00	3.12	2.39
UPDRS II	110	1.00	34.00	13.44	5.78
UPDRS III	110	6.00	56.00	24.73	10.79
UPDRS IV	110	0.00	16.00	3.48	3.32

The mean PDQ-39 score was 41.3 ± 20.7. Table 1 moreover shows the scores obtained in the different dimensions comprised in the aforementioned scale. The score in the case of UPDRS I (mental condition) was 3.1 (SD = 2.9), versus 12.4 (SD = 6.8) for UPDRS II (daily life activities), 24.7 (SD = 10.8) for UPDRS III (motor condition) and 3.1 (SD = 2.4) for UPDRS IV (drug-related complications). All these scores and their respective ranges are reflected in table 2.

Correlations of statistical significance ($p < 0.01$) and of moderate to great magnitude ($r > 0.4$) were obtained between the following variables: the PDQ-39 score versus the UPDRS I, II, III and IV scores, and, as expected, between the years of disease and the duration of treatment with levodopa and UPDRS IV score (see table 3 – correlations matrix). A significant correlation was recorded between the mean PDQ-39 score and the equivalent dose of levodopa, although this correlation was of minor magnitude (r: 0.27; p: 0.004).

We likewise correlated the total PDQ-39 score to all the subscores of the UPDRS III, to determine which items contribute most to worsened quality of life. The items in

Table 3. Bivariate correlations (Pearson correlation coefficient) among the different variables analyzed in the study

		PDQ-39	UPDRS III	Age years	UPDRS IV	UPDRS II	UPDRS I	Evolution years	Years on levodopa
PDQ-39	Pearson correlation	1	0.506**	0.242*	0.397**	0.753**	0.648**	0.292**	–0.196*
	Significance (2-tailed)		0.000	0.011	0.000	0.000	0.000	0.002	0.040
	n	110	110	110	110	110	110	110	110
UPDRS III	Pearson correlation	0.506**	1	0.124	0.310**	0.667**	0.443**	0.350**	–0.031
	Significance (2-tailed)	0.000		0.197	0.001	0.000	0.000	0.000	0.745
	n	110	110	110	110	110	110	110	110
Age, years	Pearson correlation	0.242*	0.124	1	–0.016	0.223*	0.151	0.214*	–0.258**
	Significance(2-tailed)	0.011	0.197		0.866	0.019	0.114	0.024	0.007
	n	110	110	110	110	110	110	110	110
UPDRS IV	Pearson correlation	0.397**	0.310**	–0.016	1	0.564**	0.266**	0.657**	–0.166
	Significance (2-tailed)	0.000	0.001	0.866		0.000	0.005	0.000	0.083
	n	110	110	110	110	110	110	110	110
UPDRS II	Pearson correlation	0.753**	0.667**	0.223*	0.564**	1	0.518**	0.516**	–0.142
	Significance (2-tailed)	0.000	0.000	0.019	0.000		0.000	0.000	0.139
	n	110	110	110	110	110	110	110	110
UPDRS I	Pearson correlation	0.648**	0.443**	0.151	0.266**	0.518**	1	0.178	–0.155
	Significance (2-tailed)	0.000	0.000	0.114	0.005	0.000		0.063	0.107
	n	110	110	110	110	110	110	110	110
Evolution, years	Pearson correlation	0.292**	0.350**	0.214*	0.657**	0.516**	0.178	1	–0.207*
	Significance (2-tailed)	0.002	0.000	0.024	0.000	0.000	0.063		0.030
	n	110	110	110	110	110	110	110	110
Years on levodopa	Pearson correlation	–0.196*	–0.031	–0.258**	–0.166	–0.142	–0.155	–0.207*	1
	Significance (2-tailed)	0.040	0.745	0.007	0.083	0.139	0.107	0.030	
	n	110	110	110	110	110	110	110	110

PDQ-39 and UPDRS: results are mean scores. * p = 0.05, ** p = 0.01: significant correlation (bilateral).

order of importance (statistical significance and magnitude) were gait (item 29, r: 0.52), getting up from the chair (item 30, r: 0.47), speech (item 18, r: 0.43), lower limb bradykinesia (items 26r + 26l, r: 0.42), postural stability (item 30,r: 0.41) and upper limb bradykinesia (items 23r + 23l + 24r + 24l + 25r + 25l, r: 0.40). While the rest of the variables showed significant correlations, these lacked importance in terms of magnitude ($r < 0.4$; table 4). It should be emphasized that tremor had little impact on quality of life (r: 0.05; p: 0.61).

After introducing the variables into a stepwise linear regression model, using the mean PDQ-39 score as dependent variable and the variables showing significant bivariate correlations as independent variables (UPDRS II was excluded, since daily life activities are included in PDQ-39, and because of the high existing colinearity), we found 3 independent variables to account for 51% of the variance of the PDQ-39 score – with important statistical significance ($p < 0.001$). In order of importance, these 3 variables were mental condition (UPDRS I), gait disorders (item 29, UPDRS III) and the complications of the dopaminergic drugs (UPDRS IV). In this equation the mean PDQ-39 score would be the sum of a constant (17.69) plus the UPDRS I score × 4.33, plus the score obtained for the item assessing gait in the UPDRS III (item 29) × 6.16, plus the UPDRS IV score × 1.18.

On analyzing the correlations of significance both statistically and in terms of magnitude between these 3 variables and the different dimensions of the PDQ-39, an important correlation was observed between the UPDRS I score and the dimension cognitive condition (r: 0.58**), the dimension emotional condition (r: 0.52**) and the dimension daily life activities (r: 0.44**). Gait disorders was correlated to the dimensions mobility(r: 0.57**) and daily life activities (r: 0.38**). And finally, the UPDRS IV was correlated to the dimensions mobility (r: 0.51**), daily life activities (r: 0.30**) and body discomfort (r: 0.25**) (** = $p < 0.01$).

Table 4. Correlations matrix between the mean PDQ-39 score and the different grouped UPDRS III subscores

		PDQ-39
Speech	Pearson correlation	0.48**
	Significance (bilateral)	$p < 0.001$
Get up from chair	Pearson correlation	0.47**
	Significance (bilateral)	$p < 0.001$
Posture	Pearson correlation	0.39**
	Significance (bilateral)	$p < 0.001$
Postural stability	Pearson correlation	0.40**
	Significance (bilateral)	$p < 0.001$
Bradykinesia	Pearson correlation	0.37**
	Significance (bilateral)	0.026
Bradykinesia lower limbs	Pearson correlation	0.41**
	Significance (bilateral)	$p < 0.001$
Bradykinesia upper limbs	Pearson correlation	0.39**
	Significance (bilateral)	$p < 0.001$
Rigidity	Pearson correlation	0.22*
	Significance (bilateral)	0.02
Resting tremor	Pearson correlation	0.05
	Significance (bilateral)	0.61
Gait	Pearson correlation	0.52**
	Significance (bilateral)	$p < 0.001$

The Pearson correlation coefficient was used.
* $p = 0.05$, ** $p = 0.01$: significant correlation (bilateral).

Discussion

The results in our series support the hypothesis that thought disorders and altered gait together with complications of dopaminergic drugs are the 3 variables with the greatest effect upon patient quality of life. Other series had already reported the importance of mental condition and educational level for quality of life among patients with PD [10–12]. Particularly, one of the most important predictive factors associated with poor quality of life was depression [12, 13]. In our case, the mean UPDRS I score showed an important correlation to the dimensions cognitive condition, emotional state and daily life activities.

Axial symptoms such as postural instability also contribute to worsen the quality of life of these patients [11, 13], since their independence is impaired. These symptoms are attributable not only to degeneration of the dopaminergic systems, but also in part to aging itself [14] and the added vascular pathology. In our patients, altered gait exerted an important effect on the dimension mobility and on daily life activities as reflected in the PDQ-39. Both dimensions show considerable improvement with the new surgical procedures for PD – as has already been demonstrated by our group [15]. In addition to patient improvement, the quality of life of the caregivers is also indirectly affected [15, 16]. We observed no important correlations between the years of disease and pharmacological treatment with dopaminergic drugs with respect to the PDQ-39 scale. A significant relationship was observed between complications attributable to dopaminergic drugs (UPDRS IV) and quality of life – though the resulting magnitude was moderate (r: 0.40). Other larger patient series have reported a greater impact of drug-related complications upon patient quality of life [12, 17]. This may be explained by the fact that in our series the patients were autonomous, with few years of disease – as a result of which the rate of complications was lower.

Sleep disorders have also been shown to exert a notable influence upon the quality of life of patients with PD [18, 19]. The fragmentation of sleep, nycturia and nocturnal motor symptoms are the most commonly reported manifestations [18, 20]. In our series no evaluation was made of the impact of these disorders upon quality of life. We addressed the impact of sleep disorders in PD in another article [21].

To summarize, the present study shows that mental condition, complications of dopaminergic drugs and physical mobility are the variables that most affect the quality of life of patients with PD. The latter variable is scantly addressed by the UPDRS III scale – a fact that should be taken into account in future versions of the instrument [8]. In our opinion, for this reason the use of quality of life scales in clinical trials is recommendable in the case of patients with PD.

References

1 Marinus J, Ramaker C, van Hilten JJ, Stiggelbout AM: Health related quality of life in Parkinson's disease: a systematic review of disease specific instruments. J Neurol Neurosurg Psychiatry 2002;72:241–248.

2 Jenkinson C, Fitzpatrick R, Peto V: Health-related quality-of-life measurement in patients with Parkinson's disease. Pharmacoeconomics 1999;15:157–165.

3 Martinez-Martin P: An introduction to the concept of 'quality of life in Parkinson's disease'. J Neurol 1998;245(suppl 1):S2–S6.

4 Peto V, Jenkinson C, Fitzpatrick R, Greenhall R: The development and validation of a short measure of functioning and well-being for individuals with Parkinson's disease. Qual Life Res 1995;4:241–248.

5 Hagell P, McKenna SP: International use of health status questionnaires in Parkinson's disease: translation is not enough. Parkinsonism Relat Disord 2003;10:89–92.

6 Siderowf A, Ravina B, Glick HA: Preference-based quality-of-life in patients with Parkinson's disease. Neurology 2002;59:103–108.

7 Martinez-Martin P, Gil-Nagel A, Gracia LM, Gomez JB, Martinez-Sarries J, Bermejo F; the Cooperative Multicentric Group: Unified Parkinson's Disease Rating Scale characteristics and structure. Mov Disord 1994; 9:76–83.

8 Brusse KJ, Zimdars S, Zalewski KR, Steffen TM: Testing functional performance in people with Parkinson disease. Phys Ther 2005; 85:134–141.

9 Hughes AJ, Daniel SE, Kilford L, Lees AJ: Accuracy of clinical diagnosis of idiopathic Parkinson's disease: a clinico-pathological study of 100 cases. J Neurol Neurosurg Psychiatry 1992;55:181–184.

10 Cubo E, Rojo A, Ramos S, Quintana S, Gonzalez M, Kompoliti K, Aguilar M: The importance of educational and psychological factors in Parkinson's disease quality of life. Eur J Neurol 2002;9:589–593.

11 Behari M, Srivastava AK, Pandey RM: Quality of life in patients with Parkinson's disease. Parkinsonism Relat Disord 2005;11: 221–226.

12 Slawek J, Derejko M, Lass P: Factors affecting the quality of life of patients with idiopathic Parkinson's disease – a cross-sectional study in outpatient clinic attendees. Parkinsonism Relat Disord 2005;11:465–468.

13 Schrag A, Jahanshahi M, Quinn N: What contributes to quality of life in patients with Parkinson's disease? J Neurol Neurosurg Psychiatry 2000;69:308–312.

14 Levy G, Louis ED, Cote L, Perez M, Mejia-Santana H, Andrews H, Harris J, Waters C, Ford B, Frucht S, Fahn S, Marder K: Contribution of aging to the severity of different motor signs in Parkinson disease. Arch Neurol 2005;62:467–472.

15 Lezcano E, Gomez-Esteban JC, Zarranz JJ, Lambarri I, Madoz P, Bilbao G, Pomposo I, Garibi J: Improvement in quality of life in patients with advanced Parkinson's disease following bilateral deep-brain stimulation in subthalamic nucleus. Eur J Neurol 2004;11: 451–454.

16 Martinez-Martin P, Benito-Leon J, Alonso F, Catalan MJ, Pondal M, Zamarbide I, Tobias A, de Pedro J: Quality of life of caregivers in Parkinson's disease. Qual Life Res 2005;14: 463–472.

17 Chapuis S, Ouchchane L, Metz O, Gerbaud L, Durif F: Impact of the motor complications of Parkinson's disease on the quality of life. Mov Disord 2005;20:224–230.

18 Martinez-Martin P, Salvador C, Menendez-Guisasola L, Gonzalez S, Tobias A, Almazan J, Chaudhuri KR: Parkinson's Disease Sleep Scale: validation study of a Spanish version. Mov Disord 2004;19:1226–1232.

19 Scaravilli T, Gasparoli E, Rinaldi F, Polesello G, Bracco F: Health-related quality of life and sleep disorders in Parkinson's disease. Neurol Sci 2003;24:209–210.

20 Chaudhuri KR, Pal S, DiMarco A, Whately-Smith C, Bridgman K, Mathew R, Pezzela FR, Forbes A, Hogl B, Trenkwalder C: The Parkinson's disease sleep scale: a new instrument for assessing sleep and nocturnal disability in Parkinson's disease. J Neurol Neurosurg Psychiatry 2002;73:629–635.

21 Gomez-Esteban JC, Zarranz JJ, Lezcano E, Velasco F, Ciordia R, Rouco I, Losada J, Bilbao I: Sleep complaints and their relation with drug treatment in patients suffering from Parkinson's disease. Mov Disord 2006; 21:983–988.