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Research Article

Factors Related with Frontal Dysfunction in Early Stages of Parkinson Disease

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Abstract

Introduction: Parkinson Disease (PD) although described initially by James Parkinson as a disease with motor disorder it has been demonstrated that the cognitive disorders in the form of disejecutive syndrome are frequent worsening with the evolution.

Objective: To characterize the Frontal Dysfunction (FD) in the patients with PD and to determine the factors related with frontal dysfunction in early stages.

Method: We studied 125 patients with diagnosis of idiopathic PD and Hoehn and Yahr Stages <2, to those which it was carried to them out survey with demographic, clinical and neuropsychological data studies included the Frontal Assessment Battery (FAB).

Results: The mean age was of 68.1±8.6, the onset age was of 62.6±10.5, the diestrums predominated and those which initiated with tremor. Of the 125 patients 71.4% presented FD, with an average of the FAB of 11.82±3.7. The age (R=-0.45; p<0.001) and onset age (R=-0.33; p=0.02) showed inversely proportional correlation with the FD. Other related variables were the schooling up to second level (p=0.003) and the rural origin with significance <0.001.

Conclusion: The age and onset age higher than 60 years, the lower schooling than second level of teaching, rural origin and the presence of cognitive dysfunction are related to FD in early stages of PD.

Keywords: Dementia; Frontal assessment battery; Frontal dysfunction; Mini mental state examination; Montreal test; Parkinson disease

Introduction

Parkinson Disease (PD) was described for first time in 1817 by James Parkinson in their monograph of 66 pages An Essay on the shaking palsy [1]. PD kept as the second degenerative disorder of the central nervous system after Alzheimer disease [2-4]. Although was initially described as a disease with motor disorder has been demonstrated that the cognitive disorders in the form of disejecutive syndrome are frequent in PD worsening with the evolution [5-13]. The patients have difficulty in maintaining adaptive responses with visuospatials and visuoperceptuals deficits, who leads to alteration of the memory of work and attentional deficits [14]. Has been demonstrated that the signs of frontal disease are well represented in subcortical pattern dementias, whose prototype can be PD [15-20]. With the present article we intended to characterize the frontal dysfunction in patients with PD and to determine the factors related with frontal dysfunction in early stages of PD.

Methods

A cross-sectional study, descriptive was conducted, to the patients with PD who went to the consultation of this disease of the University Hospital Dr. Gustavo Aldereguía Lima. With in a period of a year for the same include all the patients in early stage of Parkinson disease (Hohen and Yahr Stages ≤2), in total 125 patients who fulfilled the following criteria: Patients with diagnosis of PD in stages I and II of Hohen and Yahr, excluding: Atypical parkinsonism or secondary, patients with severe depression or delirum, patients with cognitive deterioration such that does not make it possible to conduct the neuropsychological study [21].

Procedure the study was carried out in two phases

First phase (phase of collection of clinical data): In this phase an interview structured with clinical, sociodemographic data and risk factors for frontal dysfunction, where it will be included age, sex, race and other demographic data as well as it will be carried out the scale UPDRS motor and scale of Hoehn and Yahr in order to determine the stage of its disease.

Second phase (phase of neuropsychological study): In this phase worked with the 125 patients, sample obtained then to be classified the patients according to the Stages of Hoehn and Yahr to those which were carried them out several neuropsychological tests: The Mini Mental State Test (MMSE), Montreal Cognitive Assessment (MoCA), depression scale of Hamilton or Ysavage for patients older than 60 years. For the assessment of the frontal dysfunction was in addition used the Frontal Assessment Battery (FAB).

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Frontal Assessment Battery (FAB)

As Dubois et al. indicate, it consists of an exploration of the characteristic functions of the frontal lobes through six subtest: Similarities (formation of concepts), verbal fluidity (mental flexibility), motor series (programming), interference (realization of conflicting instructions), control (inhibition of responses), and autonomy (independence of the exterior environment) [22]. Each subtest is assessed from 0 to 3 points and, as a result, the maximum scoring is of 18 points. For the classification of the frontal dysfunction we take: As frontal dysfunction the scoring was lower than 15 points. The cut off point for the frontosubcortical deficit we locate it in 16-15, and the cut off point for dementia frontosubcortical, in 14-12 [23].

Cognitive deterioration

Finally the diagnosis of each patient was carried out according to the criteria for Diagnostic and Statistical Manual of Mental Disorders (DMS-IV). The severity of the deterioration will be evaluated through the criteria for Parkinson Dementia (PD), taking as mild cognitive deterioration to the patients who presented scorings of the MMSE and MoCA between 23 and 26 points the patients who presented scorings lower than the previous ones were considered carrier of dementia [13].

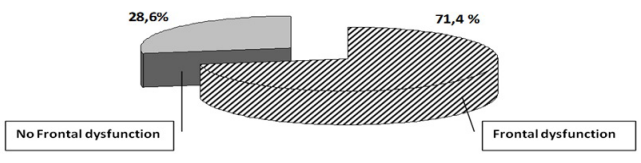
Statistical analysis

For processing of the data the SPSS v15.0 statistical program for windows was utilized. There was considered statistically significant one $p<0.05$. There were compared the values of the averages of the demographic variables (age, onset age, time of evolution, schooling) and clinical (UPDRS scale, predominant symptom, clinical onset) related to the frontal dysfunction of the patients through the Student's t. A correlation of the values of the FAB was in addition carried out with the clinical and demographic variables through Pearson's correlation coefficient, increasing its significance when the values of R come closer to one.

Consequently, during the planning of this research we will respect the ethical principles of research on human beings [12,13].

Results

In table 1 we found the onset age 62.6±10.5 years old and the current age 68.1±8.6 years old, remain as well as the world average in the sixth decade of life, prevailing the form of beginning tremoric, in addition the time of evolution mean was of 5.6±4.3 years in spite of being in the first motor stages of the DP, with a mean of the motor UPDRS in On and Off that does not arrive at the 20 points.



Graph 1: Distribution of the patients according to the frontal activity.

With regard to the variables related to the frontal dysfunction (Table 2) we found that the patients who presented frontal dysfunction had an average of age higher than those which remained with the adequate frontal functions ($p=0.02$), occurring the same with the variables that measure global cognitive alteration basically the MoCA where its values differ between groups presenting a mean of 16.9±4.3 ($p<0.0001$).The MMSE also showed a relevant difference between groups with an statistical significance ($p=0.01$).

Variables	Mean±SD
Age	68.1±8.6
Onset age	62.6±10.5
Time of evolution (years)	5.6±4.3
UPDRS motor On	14.7±6.0
UPDRS motor Off	18.6±6.4
Clinical Variables of the Sample Given in Percentage	
Variables	**Percentage**
Clinical onset tremoric/Rigid-acinetic	77.6/27.7
Diestrums/Left-handed	81.6/2.6
Predominant symptom tremor/Rigidity	53.7/46.3
Source: Conducted survey	

Table 1: Relation of the clinical variables of the sample.

	Frontal Dysfunction	Without Frontal Dysfunction	p
Age	69.91±7.89	64.39±9.8	0.02
UPDRS motor On	14.74±5.9	14.38±5.35	0.82
UPDRS motor Off	18.41±6.23	18.50±5.9	0.96
MoCA	16.9±4.3	21.56±2.77	<0.0001
MMSE	22.17±3.4	24.13±2.09	0.01
Source: Conducted survey			

Table 2: Relationship between the mean±SD of clinical/demographic variables and the presence of frontal dysfunction.

In table 3 we found that the average of the FAB was lower in the patients with rural origin ($p<0.001$), those which attended only up to the second level of teaching (10.9±3.9; $p=0.003$), onset age and current age older than 60 years with a significance of 0.02 and 0.025 respectively. Not occurring statistical significance among the stages I and II of Hoehn and Yahr although showed mean of the FAB lower in the stage I.

Variables		Mean±SD	p
Age	≤60 años	14.30±2.7	0.025
	> 60 años	11.43±3.8	
Onset age	≤60 años	13.22±2.8	0.02
	> 60 años	10.78±3.9	
Origin	Rural	10.13±3.6	<0.001
	Urban	14.22±2.9	
Schooling	Up to second level	10.9±3.9	0.003
	After the second level	13.95±2.7	
Stage of Hoehn and Yahr	STAGE I	11.11±2.6	0.43
	STAGE II	12.21±3.9	
Source: Conducted survey			

Table 3: Relation of the mean±SD of the FAB and clinical/demographic variables according to t student.

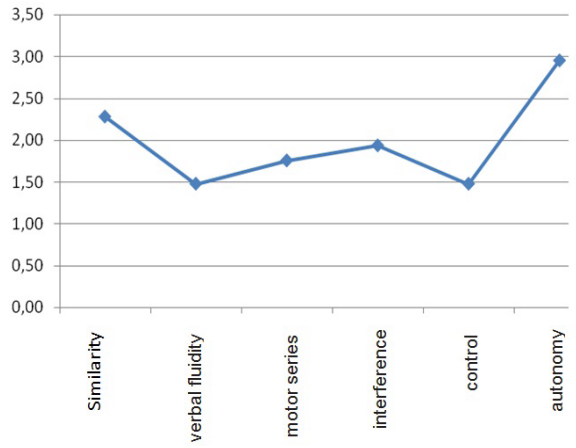
Upon establishing the correlation among the clinical and demographic variables with the values of the FAB (Table 4) we find that the age (R=-0.45; p<0.001) and onset age (R=-0.33; p=0.002) showed an inversely proportional correlation in relation with regard to the values of the FAB. The schooling showed gave directly proportional values (R=0.43; p=0.001), that is to lower values of the schooling lower values of the FAB. The rest of the clinical variables did not show statistical significance including the evolution time.

m=11.82±3.7(a)	R	p
Age	-0.45**	<0.001
Onset age	-0.33	0.02
Schooling	0.43	0.001
UPDRS motor On	-0.08	0.6
UPDRS motor Off	-0.1	0.9
Time of evolution (years)	0.14	0.3

Table 4: Correlation of demographic and motor variables with the FAB's scoring.

** The correlation is significant at level 0.01 (bilateral).
(a) Mean of the FAB ± Standard deviation.

In the graph 2 can see as the means items of the FAB, in all study's pacients, that presented lower values were the fluidity and motor series, occurring the opposite with the behavior of compenzación with an almost equal average value to 3.00, that is maximum value.



Graph 2: More affected frontal functions in early stage of Parkinson's disease (according to FAB).

Discussion

The present study emphasizes us that the frontal affectations are presented at onset of the PD.

Analyzing the demographic variables these do not differ from the reviewed studies that have dealt with widely this subject, being noteworthy that the majority of the patients present a schooling that does not surpass the secondary teaching bearing no relation this with the origin that presents both similar percentages for those which are of rural origin and urban [24].

The age is kept as one of the principal variables related to the frontal dysfunction, being able to be in relation this with which as advances the age occur cognitive alterations, although the average for this of our study was of 68.1 years, being noteworthy that the motor scales of the PD did not show a statistically significant relation, occurring the opposite with the neuropsychological scales that demonstrate the presence of global cognitive alteration, represented by the association of frontal dysfunction with the MoCA and MMSE what translates that in the beginning of the EP not only are affected prefrontal cortical areas, but also parietal areas and rising subcorticales systems, that they utilize other neurotransmitters; in addition to parts of the striate one as putamen, caudate or nucleus accumbens that is associated with the implicit learning of habits or of incentive response and sensoriomotor coordination, most adequate planifcación of each incentive [25,26].

Furthermore find that both the age and the onset age present an inversely proportional correlation, which is to greater age and greater onset age smaller scoring of the FAB and greater frontal dysfunction, with a greater significance for a point of cut off greater than 60 year [27,28].

With the results of this study is shown that the affectation in the frontal lobes comes together with the onset of the disease, then seem to be affected different cortico-subcortical circuits that act parallels and similar with regard to their structure and organization, affecting in this form the closed circuit that is originated in a private area of the frontal córtex that transmits the information through the basal nodes and returns to the place of departure in the lobe frontal.

Furthermore occurs specific disorder: In the motor circuits that leads to the classical acinesia or bradycinesia, the dorsolateral frontal circuit that is translated into a disejecutive syndrome with disability for the mental flexibility and the change of criteria, in planning and generation of strategy, in the organization of the actions, in the utilization of the experience and in the production of a spontaneous activity, in addition to the previous cingular circuit by the presence of the reduction of the initiative and the maintenance of the attention.

Conclusion

The present study demonstrates that already in early stages of PD occurs degeneration in different frontal cortical regions as the motor cortex, premotor, dorsolateral and cingular area. With variables that are related to the frontal dysfunction as the age and onset age above 60 years, the lower schooling than second level of teaching as well as the presence of generalized cognitive affectation.

Acknowledgement

None.

Conflict of Interest

The author declares there is no conflict of interest.

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