THE ACCURACY OF DIAGNOSIS OF MAJOR DEPRESSION IN PATIENTS WITH PARKINSON'S DISEASE

A comparative study among the UPDRS, the Geriatric Depression Scale and the Beck Depression Inventory

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Abstract – Objective: Evaluate the accuracy of diagnosis of major depression in patients with Parkinson's disease (PD) using the UPDRS, the 15-item Geriatric Depression Scale (GDS15) and the Beck Depression Inventory (BDI). **Method:** 50 consecutive patients with PD were evaluated. The diagnosis of major depression was made according to the DSM-IV criteria. **Results:** We found a 24% prevalence of major depression. All depression scales were highly correlated but UPDRS depression item had the lowest diagnostic value. The GDS15 had the more appropriate "receiver operating characteristics" curve. The best cut-off scores for screening depression were 17/18 for BDI and 8/9 for GDS15. We did not find any correlation between the level of depression and intensity of motor symptoms, functional capacity and duration of the disease. **Conclusion:** GDS15 is better than the BDI and the UPDRS for screening depression in PD and depression is not related to the degree of parkinsonian symptoms.

KEY WORDS: depression, Parkinson's disease, UPDRS, Beck Depression Inventory, Geriatric Depression Scale.

A precisão do diagnóstico de depressão na doença de Parkinson: um estudo comparativo entre a UPDRS, a Escala Geriátrica de Depressão e o Inventário de Depressão de Beck

Resumo – Objetivo: Avaliar a precisão do diagnóstico de depressão em pacientes com doença de Parkinson avaliados pela UPDRS, pela Escala Geriátrica de Depressão com 15 itens (EGD15) e pelo Inventário de Depressão de Beck (IDB). **Método:** 50 pacientes com DP foram avaliados. O diagnóstico de depressão maior foi feito segundo os critérios do DSM-IV. **Resultados:** A prevalência de depressão foi 24%. As escalas de depressão tiveram elevada correlação entre si. A UPDRS apresentou a menor sensibilidade para o diagnóstico. A EGD15 mostrou uma curva ROC mais apropriada que o IDB. Os melhores escores-de-corte para diagnóstico de depressão foram 17/18 para o IDB e 8/9 para a EGD15. Não houve correlação entre os níveis de depressão e a intensidade do parkinsonismo, a capacidade funcional ou a duração da doença. **Conclusão:** A EGD15 é melhor que o IDB para diagnosticar depressão na DP. A depressão não está relacionada à gravidade dos sintomas parkinsonianos.

PALAVRAS-CHAVE: depressão, doença de Parkinson, UPDRS, Escala Geriátrica de Depressão, Inventário de Depressão de Beck.

Depression is a frequent co-morbidity affecting around 20% to 40% of patients with Parkinson's disease (PD)[1]. Moreover, depression is also pointed as one of the most important factors impairing the quality of life of patients and their caregivers[2,3]. Despite its clinical significance, depression still remains as an underdiagnosed problem in patients with PD[4].

One reason for that may be the little attention given for this problem during the clinical evaluation. The Unified Parkinson's Disease Rating Scale (UPDRS) dedicates only one item to evaluate depression[5]. The clinician rates his clinical impression after a free medical interview and grades depression subjectively at 4 levels of severity. To our knowledge, the reliability and validity of the UPDRS

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to diagnose and grade depression had never been evaluated, but is expected to be far from perfect. One strategy to improve the diagnosis of depression is to make use of self-reporting scales.

On this basis, we decided to investigate the accuracy of diagnosis of major depression in patients with PD evaluated with the UPDRS, and also to compare, for the same purpose, two self-reported scales for diagnosis of depression: the15-item shortened version of the Geriatric Depression Scale (GDS15)[6] and the Beck Depression Inventory (BDI)[7].

METHOD

Fifty consecutive patients with idiopathic PD who attended a Brazilian Movement Disorder Outpatient Clinic in Ribeirão Preto School of Medicine were evaluated. The inclusion criteria were a clinical diagnosis of PD[8], absence of cognitive deficits as defined by the UPDRS, and sufficient educational level to be able to self-report properly the GDS15 and the BDI. Patients were first evaluated by a neurologist who was not aware of the main purpose of the study. In a routine medical evaluation he classified the patients according to the UPDRS, Hoehn and Yahr stage (HY) and Schwab and England (SE) scale. For motor assessment the examiner employed a shortened version of the UPDRS motor subscale with only 8 items. This shortened version scored the same signs evaluated by the Short Parkinson's Evaluation Scale[9] but with the original 5-point items of the UPDRS. This shortened scale was proven to have a good reliability and validity in Brazilian patients with PD[10]. After this evaluation, patients who met the inclusion criteria were required to self-complete the validated Brazilian versions of the GDS15 and the BDI[11, 12]. Some help for the patient by the accompanying person was allowed if he requested some assistance. This procedure was completed in an isolated room without the presence of any medical personnel. All patients were evaluated while in the "on-state" if they were taking levodopa. After filling out the self-reported scales, patients were again evaluated by another neurologist who was unaware of the first neurological evaluation and of the patient's scale scores. He was trained for, and conducted a free clinical interview directed at the diagnoses of major depression according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV)[13]. All subjects underwent these sequential evaluations on the same day. Other demographic and clinical information were recorded for each patient such as sex, age, age at disease onset and duration of disease.

For statistical analysis, data from patients with major depression according to DSM-IV criteria were compared to data from those without depression. Qualitative categorical variables were compared using the Chi-square test, while quantitative variables were analyzed by the Mann-Whitney test when the Shapiro-Wilks test showed that they did not follow a normal distribution. We also looked for correlations using the Spearman nonparametric correlation test. The diagnosis of major depression according to DSM-IV criteria was used as the gold-standard method. All scales were evaluated by their "receiver operating characteristics" curve (ROC curve) for identifying the single cut-off point that better discriminates between depressed and non-depressed patients. This study was approved by the local ethics committee and patients included in this study gave their informed consent to participate.

Table 1. Demographic and clinical features of 50 consecutive patients with Parkinson's disease (PD) screened for major depression according to the DSM-IV diagnostic criteria.

	PD without depression	PD with depression	p
Number of patients	38	12	
Taking antidepressive drugs	12	7	
Male/Female	20/19	6/5	0.73
	mean (SD)	mean (SD)	
Age (years)	62.4 (12.6)	64.5 (12.7)	0.70
Age of PD onset (years)	54.5 (14.5)	56 (12.9)	0.84
PD duration (years)	7.9 (5.2)	8.4 (4.7)	0.63
Shortened UPDRS motor score	12.57(9.51)	12.08 (7.50)	0.81
Hoehn and Yahr	2.1 (0.7)	2.4 (0.9)	0.05
Schwab and England	78.8 (16.2)	73.7 (18.9)	0.39
Depression item of the UPDRS	0.60 (0.91)	1.94 (1.54)	<0.0001*
GDS15	4.65 (3.27)	11 (2.46)	<0.0001*
BDI	12.6 (9)	26.5 (10.6)	<0.0001*

SD, standard deviation; *significant difference (p<0.05); UPDRS, Unified Parkinson's Disease Rating Scale; GDS15, 15-item Geriatric Depression Scale; BDI, Beck Depression Inventory.

Table 2. Correlations between Parkinson's disease (PD) duration and clinical and depression scales.

	Disease duration	Hoehn and Yahr	Schwab and England	UPDRS motor score	GDS	BDI	UPDRS depression item
PD duration	1	0.55*	−0.39*	0.11	0.12	−0.03	0.02
Hoehn and Yahr	0.55*	1	−0.75*	0.53*	0.26	0.22	0.03
Schwab and England	−0.38*	−0.75*	1	−0.56*	−0.26	−0.23	−0.11
UPDRS motor score	0.11	0.53*	−0.56*	1	0.20	0.23	0.13
GDS15	0.12	0.26	−0.26	0.20	1	0.62*	0.38*
BDI	−0.03	0.22	−0.23	0.23	0.62*	1	0.48*
UPDRS humor item	0.02	0.03	−0.11	0.13	0.38*	0.48*	1

*Spearman correlation coeficient with p‹0.05; any correlation found for age, sex and age of disease onset; UPDRS, Unified Parkinson's Disease Rating Scale; GDS15, 15-item Geriatric Depression Scale; BDI, Beck Depression Inventory.

RESULTS

The clinical and demographic features of the 50 consecutive patients with PD evaluated are reported in Table 1. We found 12 patients with actual diagnosis of major depression according to the DSM-IV criteria, corresponding to a prevalence of 24% in our sample. The diagnosis of major depression after the first neurological evaluation guided by the UPDRS had sensitivity (SEN) of 75% and specificity (SPE) of 63%.

There were no significant differences between depressed and non-depressed patients regarding sex distribution, age at disease onset, disease duration, Hoehn and Yahr (HY) stage, shortened UPDRS motor score and Schwab and England (SE) functional scale. However, depressed patients had significantly higher scores on all depression scales: depression item of the UPDRS (p<0.0001), GDS15 (p<0.0001) and BDI (p<0.0001).

Most patients did not report to be in trouble to self-complete the depression scales, but one patient evolved to the off-state and was unable to fill out the BDI, and another patient reported difficulties and refused to complete the BDI. Only the latter patient was depressed. These patients were not excluded from analysis where the BDI were not included for comparisons.

We found a high correlation between disease duration, HY stage and SE functional scale (Table 2). The HY and SE scales were highly correlated with each other and with the UPDRS shortened motor score. Otherwise, the depression scales were highly correlated but did not have any correlation with the duration of the disease or with the other clinical scales for PD. We did not find any significant correlation for age, sex or age at PD onset.

The ROC curve analysis showed that the GDS15 curve had the closest approach to the left upper angle of the graph in comparison to the BDI curve, and that the GDS15 curve approach had a single-pointed shape while the BDI curve approach was broadened without defining a single optimal point. The last finding indicates that for the
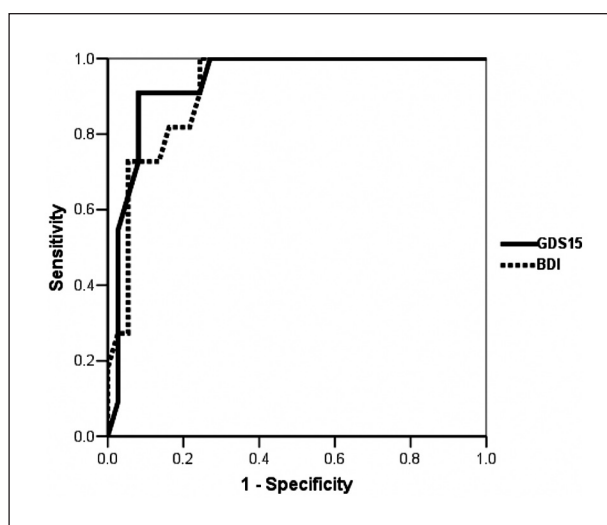

Figure. ROC curve ("receiver operating characteristics curve") of the 15-item Geriatric Depression Scale (GDS15) and of the Beck Depression Inventory (BDI) depression scales for detecting major depression in patients with Parkinson's disease according to DSM-IV criteria. We can see that the area under the curve is wider for the GDS15 which also had a single-pointed and closer approach to the left upper angle of the graph than the BDI curve.

GDS15 it would be satisfactory to define only a single optimal cut-off score for the diagnosis and screening of depression, while for the BDI it would be necessary to establish 2 distinct cut-off scores for each of these purposes. The AUC was wider for the GDS15 (0.939) than for the BDI (0.918) (Figure).

The maximal discrimination between depressed and non-depressed patients was reached for GDS15 at the cut-off score of 8/9 with SEN of 91% and SPE of 92%, and for diagnostic purposes the best cut-off score was 10/11 with SPE of 97% and predictive positive value (PPV) of 88%. For BDI, the maximal discrimination between depressed and non-depressed patients was reached at the cut-off score of 17/18 with SEN of 100% and a SPE 76%, whereas for di-

agnostic purposes the best cut-off score was 26/27 with SPE of 95% and PPV of 80% .

DISCUSSION

We found a 24% prevalence of major depression in a group of 50 consecutive patients with PD attending a specialized outpatient clinic that is very similar to what was observed by studies assessing similar samples[1,14,15]. The routine clinical evaluation using the UPDRS showed moderate power to detect depression in PD (SEN of 75% and SPE of 63%), considering that the clinicians were not specifically instructed to search for this clinical problem. Moreover, the UPDRS depression item was well correlated with the scores of the other depression scales, indicating that the subjective construct of depression generated by the clinician in a free clinical interview parallels that measured by these structured scales. These findings indicate a reasonable clinical competence to detect depressive symptoms in patients with major depression that is by no means close to satisfactory levels. However, 5/12 (45%) PD patients with depression were not in use of antidepressive drugs, suggesting that despite de correct diagnosis many patients are still left untreated.

We found that the scores of the GDS15 and BDI clearly differentiated depressed from non-depressed patients and were highly correlated, as was previously reported[16]. Our findings suggested that the GDS15 is better than the BDI for screening depression in patients with PD. The GDS15 had a wider ROC curve indicating a higher discriminative property, and a more convenient approach to the left upper quadrant of the graph than the BDI. Other practical advantages of the GDS15 would be that it is shorter, easier and quicker to fill out than the BDI, none of the 15 items being somatic, and is currently one of the most used depression self-reported scales in the old age[17]. Our findings for the BDI are closely similar to those obtained by Leentjens et al.[15]. The GDS15 and BDI are depression scales widely employed in Brazilian settings and validated versions are available. As we had showed, it is a useful strategy to employ self-reported scales as an alternative clinical approach to improve the diagnosis of depression in PD. Although there are no sufficient data to attain a consensus about the most proper scale to be used in patients with PD, we suggest that the GDS15 may be an effective alternative.

Considering that the profile of depressive symptoms in PD may differ from that in depressed subjects without PD[18] and that some clinical manifestations of PD may be misinterpreted as somatic symptoms of depression, we would expect the optimal cut-off scores for screening depression in these patients would be distinct from that defined for the general population. However, our findings

and other studies did not corroborate this assumption. For the BDI, it was described that the cut-offs ranged from 15 to 20 in most studies conducted on the general population[19]. This is very similar to that stipulated specifically for patients with PD: 13/14 by Leentjens et al.[15], 17/18 by Silberman et al.[20], 14/15 by Visser et al.[21], and 17/18 by our study. For the GDS15, community-based studies with elderly patients showed that the cut-off scores for screening depression ranged from 5 to 10 and in most of them between 5 or 6, with a SEN and SPE around 90% and 70% respectively[12,22-24]. Our study defined that 8/9 was the best cut-off score for screening and diagnosing major depression in patients with PD, what is similar to those defined for the general population. We may conclude that the optimal cut-off scores for the BDI and GDS15 did not differ substantially for screening depression in the community or in patients with PD.

In our study, the level of depression was not correlated with the intensity of motor symptoms or with the functional capacity as was previously reported by others[25,26], and we did not find an association between the degree of depression and the duration of the disease. The lack of association between motor and affective symptoms in PD is considered to be clinical evidence that depression may be induced by distinct pathophysiological mechanisms than those responsible for the motor signs. This hypothesis is supported by the findings that link depression in PD to a specific loss of serotonin, dopamine and noradrenalin in the limbic system but not to the striatal dopaminergic depletion[27]. Nevertheless, the association between motor and affective symptoms in PD is an unsolved matter, since other studies have found a relation between depression and the parkinsonian signs[14,22,28]. One possible explanation for our findings could be the fact that most of our patients were evaluated while they were under the effect of medication, so that their true clinical state was not manifest. Another point is that depression may be related to certain clinical aspects of the disease like the degree of bradykinesia or the presence of wearing-off phenomena[29]. If there was a bias in sample selection, with a predominance of patients presenting with the rigid-akinetic form of PD or with motor complications, the study could be more prone to detect an association between motor signs and depression. In view of our current knowledge about depression in PD, it would be more suitable to regard it as a complex and multifactorial problem that also includes situational and psychological factors taking part in the mechanisms that can elicit mood changes in the patients[30]. Appropriate studies are needed to address this controversial matter.

In conclusion, the use of self-reported scales improves the diagnosis of depression as given solely by the routine

clinical evaluation and the GDS15 is better than the BDI for screening depression in PD. The symptoms of depression in PD are not related to the degree of parkinsonian symptoms.

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