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Short communication

An analysis of the cognitive items of the movement disorders society checklist for the diagnosis of dementia in patients with Parkinson's disease

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ABSTRACT

Objective: Some studies about the Movement Disorders Society checklist for the diagnosis of Parkinson's disease (PD) dementia (PDD) suggested that its accuracy was not totally satisfactory. Our study focused to evaluate the two items of the checklist related to the cognitive assessment.

Methods: We assessed 95 consecutive patients with a diagnosis of PD using the UPDRS, Hoehn and Yahr, Schwab and England scales, Pfeffer Functional Activities Questionnaire, MMSE, Clinical Dementia Rating, clock drawing test, verbal fluency test (animals), digit span, word list battery of CERAD, Frontal Assessment Battery and the 15-item Geriatric Depression Scale The cognitive diagnosis was based on the MDS diagnostic criteria for PDD. The checklist was completed later by a blinded investigator. The data were evaluated using descriptive analysis and calculation of sensitivity, and specificity of the checklist for the diagnosis of PDD.

Results: 33 patients (35%) were diagnosed with PDD. The ROC curve showed that the MMSE cut-off score < 26 had the highest accuracy (sensitivity: 94%, specificity: 55%) for the diagnosis of PDD. Using the checklist with original cut-off scores we found sensitivity of 97% and specificity of 58%. Using an alternative way to interpret the cognitive assessment of the checklist we found sensitivity of 94% and specificity of 89% for the diagnosis of PDD.

Conclusions: Our findings suggest that to improve the accuracy of the checklist, it would be necessary to adjust the way we use and interpret the cut-off scores of the MMSE and of the subtests, without the need to eliminate their use.

Since the publication of a checklist suggested by the Movement Disorders Society (MDS) to be used as a practical instrument (level I) for the diagnosis of Parkinson's disease (PD) dementia (PDD), many studies have assessed the validity of this procedure [1]. In general, the studies revealed variable findings, but most authors concluded that the accuracy of the instrument was not totally satisfactory [2–6]. Because of this, a number of alternatives have been proposed to improve the accuracy of the MDS checklist, including the search for a better mini-mental state examination (MMSE) cut-off score; replacement of the MMSE by another short global cognitive scale; exclusion of the requirement to determine the impairment of specific cognitive domains, use of more sensitive tests to assess the cognitive domains or exclusion of abnormal MMSE score as a requirement in the checklist [2,4–6].

The practical procedure consists of an 8-item checklist based on the specific diagnostic criteria recently proposed for the diagnosis of PDD, and requires all items to be present for the diagnosis. Some of these items seem to be strategically sensitive for the diagnostic accuracy of the instrument, including the two items related to the cognitive assessment.

For the diagnosis of probable PDD, the checklist requires the presence of decreased global cognitive efficiency and impairment in more than one cognitive domain. The first requirement is based on the performance in the MMSE, and the second is based on the performance in some MMSE subtests, in the lexical fluency test and the clock drawing test.

The major advantage of using this series of tests is to center the cognitive assessment on the MMSE, which is the most widely used cognitive test throughout the world. However, it has been shown

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that the MMSE may be inaccurate for the diagnosis of PDD and there are doubts regarding the accuracy of some of its cognitive subtests.

These issues have raised concerns about the interpretation and actual applicability of the MDS checklist for the diagnosis of PDD. We therefore decided to assess the accuracy of the MDS checklist in a sample of patients with PD, focused mainly on the evaluation of the two items related to the cognitive assessment. We explored the effects of using different cut-off scores in the cognitive tests and of changes in the way of interpreting the cognitive items of the checklist.

1. Methods

We assessed 121 consecutive patients with a diagnosis of PD according to the United Kingdom Brain Bank diagnostic criteria. The patients were assessed by a neurologist (C.P.S. or G.N.O.) who applied the UPDRS, the Hoehn and Yahr scale, the Schwab and England scale, the Pfeffer Functional Activities Questionnaire (PFAQ), and the MMSE. The patients were then assessed by a second neurologist (C.P.S. or G.N.O.) who applied the Clinical Dementia Rating (CDR), the clock drawing test, the verbal fluency test (VFT-animals), the digit span test of the WAIS-III battery, the word list battery of CERAD, the Frontal Assessment Battery, and the 15-item Geriatric Depression Scale. These cognitive tests were chosen because they have reliable normative data for the population under study and included at least one test for each of the major cognitive domains that should be evaluated according to the proposed diagnostic criteria. The evaluations were carried out with a maximum interval of 4 weeks. A neuropsychologist trained the examiners and supervised the application of the cognitive tests (M.P.F.).

Functional status was defined based on the information collected with the CDR and PFAQ. In the interviews for rating these instruments, the evaluators subjectively considered only the functional limitations arising from potential cognitive impairment, and not from autonomic or motor problems. The final classification of cognitive status was based on review of clinical and neuropsychological data for each subject in a consensus conference (C.P.S., G.N.O.), and the diagnosis of PDD was ascertained if both examiners agreed with the diagnosis of dementia. The neuropsychologist was not involved in this process because of local logistical difficulties. We used a systematized process to analyze each case, in which the examiners especially looked for evidences of global cognitive decline (by history and performance in cognitive tests) and specially functional impairment due to cognitive deficits using the PFAQ and CDR. They followed the MDS diagnostic criteria for PDD and performance in the cognitive tests was considered abnormal when results were below the 5th percentile of the population [7]. The definition of decreased global cognitive efficiency was stated if there was convergence between the performance in the cognitive tests and in the evaluation with the CDR and PFAQ.

The level I checklist was completed later, in a retrospective way, by a blinded investigator that used the data recorded in the assessment protocol.

We analyzed the data using the abnormal cut-off scores originally proposed for the checklist (MMSE: <26, serial 7's: >1 incorrect response, 3-word recall: at least 1 word missing, drawing: if did not include two pentagons that overlap), and for executive function we used the semantic VFT for animals (abnormal if < 12 animals) [8].

We also analyzed the data using stricter cut-off scores. For the MMSE, we used cut-off scores recommended for the Brazilian population taking into account different levels of education [9]. Cut-off scores that were 1.5 standard deviations below the mean for the normal population were considered abnormal. For the cognitive subtests, we used the following cut-off points: serial 7's: >3 incorrect responses, 3-word recall: 3 words missing, drawing: if did not include two pentagons that overlap, VFT – animals: abnormal if < 10 animals. These scores were used because they were found to be below the 5th percentile of the expected values for the local population in a normative study (unpublished data). The recommendation for the interpretation of the MMSE according to different levels of education was based on normative studies conducted in Brazil, but despite the known interference of age, in this publication there is no consensus statement about adjustments to be considered in relation to age for interpretation of the test [9].

The local research ethics committee approved the study and all participants provided a signed informed consent to participate.

The data were evaluated using descriptive analysis and calculation of receiver operating curves (ROC), sensitivity, and specificity for the diagnosis of dementia.

2. Results

From the original sample, 21 patients were excluded from the final analysis due to diagnosis of major depression (7 patients), mental confusion or psychosis (8 patients), inability to complete the cognitive tests (6 patients), and incomplete clinical data (5 patients). In all 95 patients included in the final analysis, the onset of cognitive symptoms occurred at least one year after the onset of the motor symptoms. Participants were mostly male (58%) and had a mean age of 62 years, 5 years of formal education, 8 years of disease onset, and mean of 2.5 in the Hoehn and Yahr scale.

According to the application of the MDS diagnostic criteria, 33 of the 95 patients (35%) were diagnosed with probable PDD.

We calculated the ROC curve for the MMSE to differentiate patients with dementia from those without dementia, and found that the MMSE cut-off score < 26 had the highest accuracy (AUC = 0.843), with sensitivity of 94% and specificity of 55% for the diagnosis of PDD (Table 1).

We also calculated the accuracy of the MMSE to diagnose PDD in our sample, but using the cut-off scores recommended for the Brazilian population [9], and found that the MMSE had sensitivity of 55% and specificity of 89% to diagnose PDD.

We tested the accuracy of fulfilling the two items related to cognitive assessment of the MDS checklist using different combinations of cut-off scores for the MMSE and the subtests, and we found that the best accuracy for the diagnosis of PDD was met when we applied the original proposed cut-off scores for the MMSE (<26) and strict cut-off scores for the subtests (sensitivity of 91% and specificity of 76%) (Table 1). The use of the original cut-off scores for the items related to cognitive assessment of the checklist yielded sensitivity of 97% and specificity of 58% for the diagnosis of PDD.

Finally, we tested an alternative way to interpret the cognitive assessment items of the checklist by applying them in the form of an algorithm. For the interpretation of the MMSE and of the subtests, we used only the stricter cut-off scores that were the most specific. If the performance in the MMSE was abnormal, indicating decreased global cognitive efficiency, the requirement to confirm the impairment in more than one cognitive domain to diagnose PDD was dropped. If the performance in the MMSE was normal, but there was impairment in more than one cognitive domain according to the performance in the subtests, the diagnosis of PDD was confirmed. Using this algorithm, we found sensitivity of 94% and specificity of 89% for the diagnosis of PDD.

3. Discussion

The publication of specific diagnostic criteria and the suggestion