Quantitative estimation of motor fluctuations in Parkinson's disease

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1.Objectives: to provide quantitative estimation of motor fluctuations in PD through a monitoring of motor response to levodopa by a 12-hours Waking-day Motor Assessment (WDMA) [1] and to develop WDMA-based Motor Fluctuation Indices.

2.Materials and Methods:

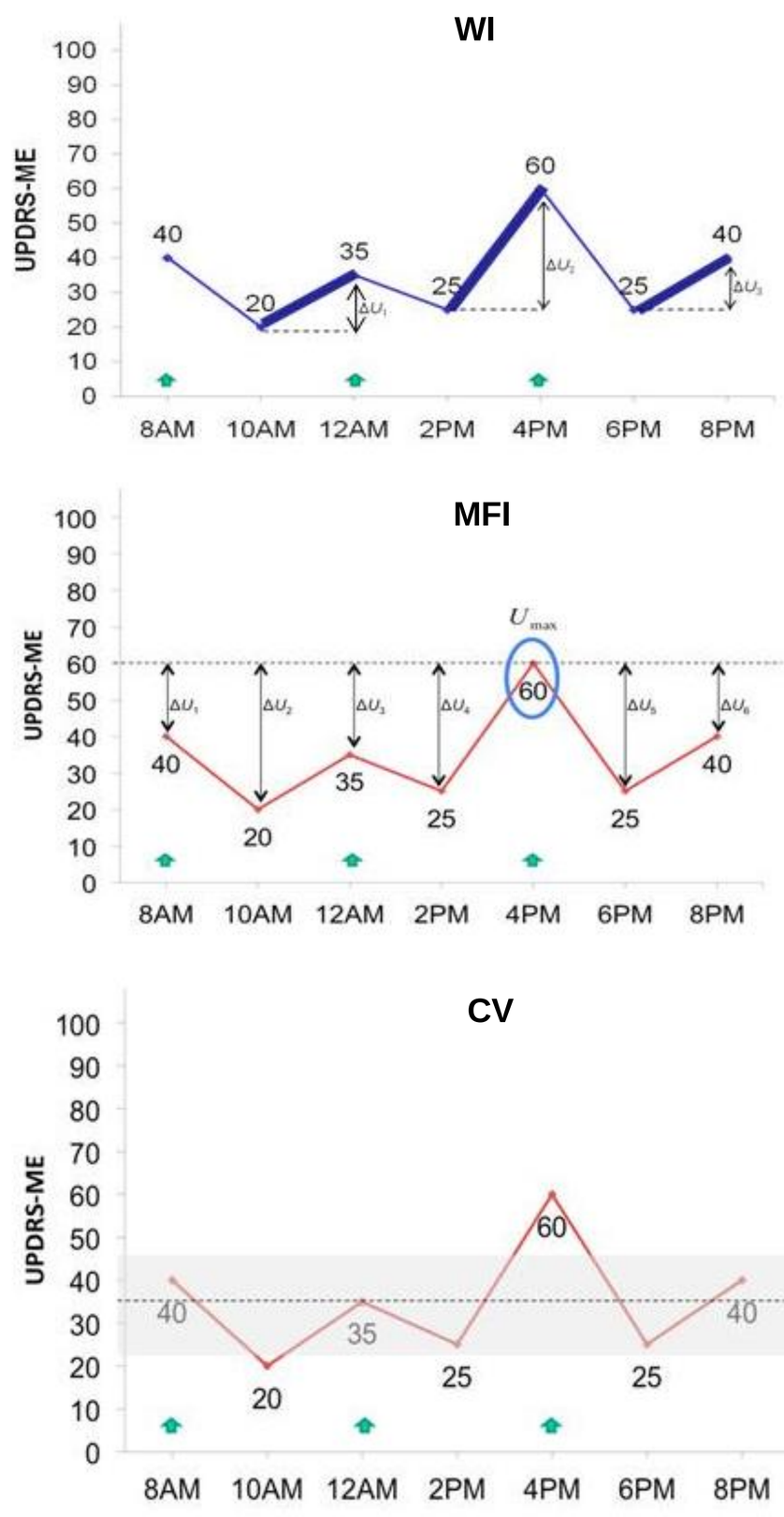
Study samples

Two independent samples of PD patients (exploratory population N=51, testing population N=109) were examined. All patients satisfied the UK Brain Bank criteria[2] and were being treated with antiparkinsonian therapy. Cognitive abilities were investigated with the Mini Mental State Examination (MMSE).[3]

Motor assessment

All patients were evaluated every 2 hours by a WDMA using the motor part of the UPDRS-III.[4] To quantify motor fluctuations, a Worsening Index (**WI**), a Mean Fluctuation Index (**MFI**) and a Coefficient of Variation (**CV**) were computed (Fig. 1).

Fig. 1. Diagrams for calculating Motor Fluctuation Indices.



Statistical analysis

The optimal cut-off for each index distinguishing patients with or without fluctuations was studied on the exploratory population by the *Receiver Operating Characteristic* (ROC) using physicians' evaluation of WDMA as *gold standard*. Indices cut-off accuracy was then verified in the testing population.

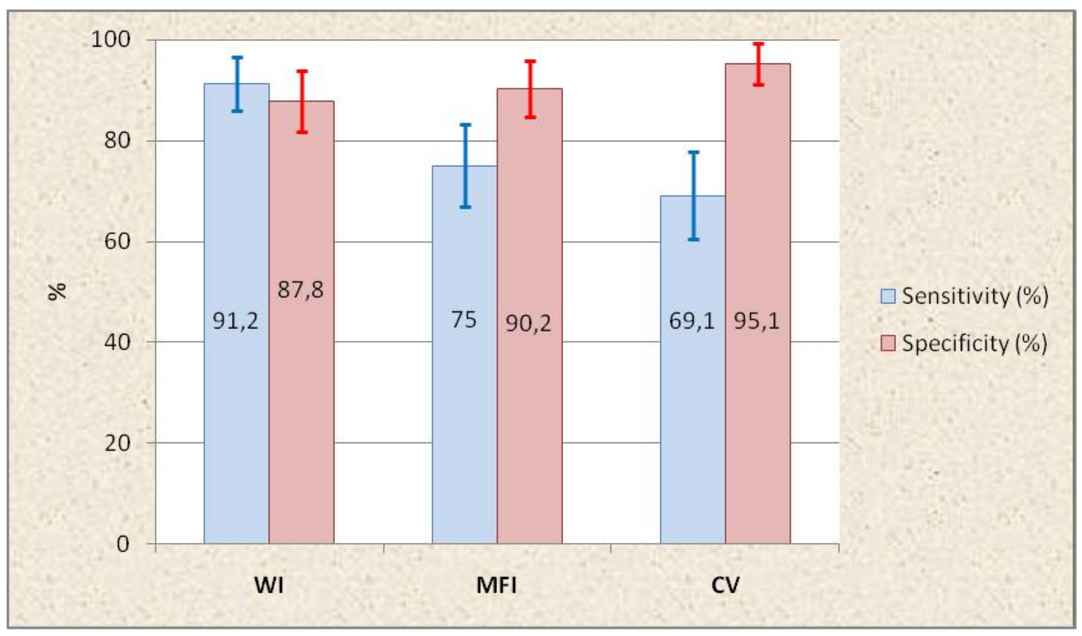
3.Results:

The optimal cut-off values calculated were:

WI = **8.3**, MFI = **5**, CV = **12.9**.

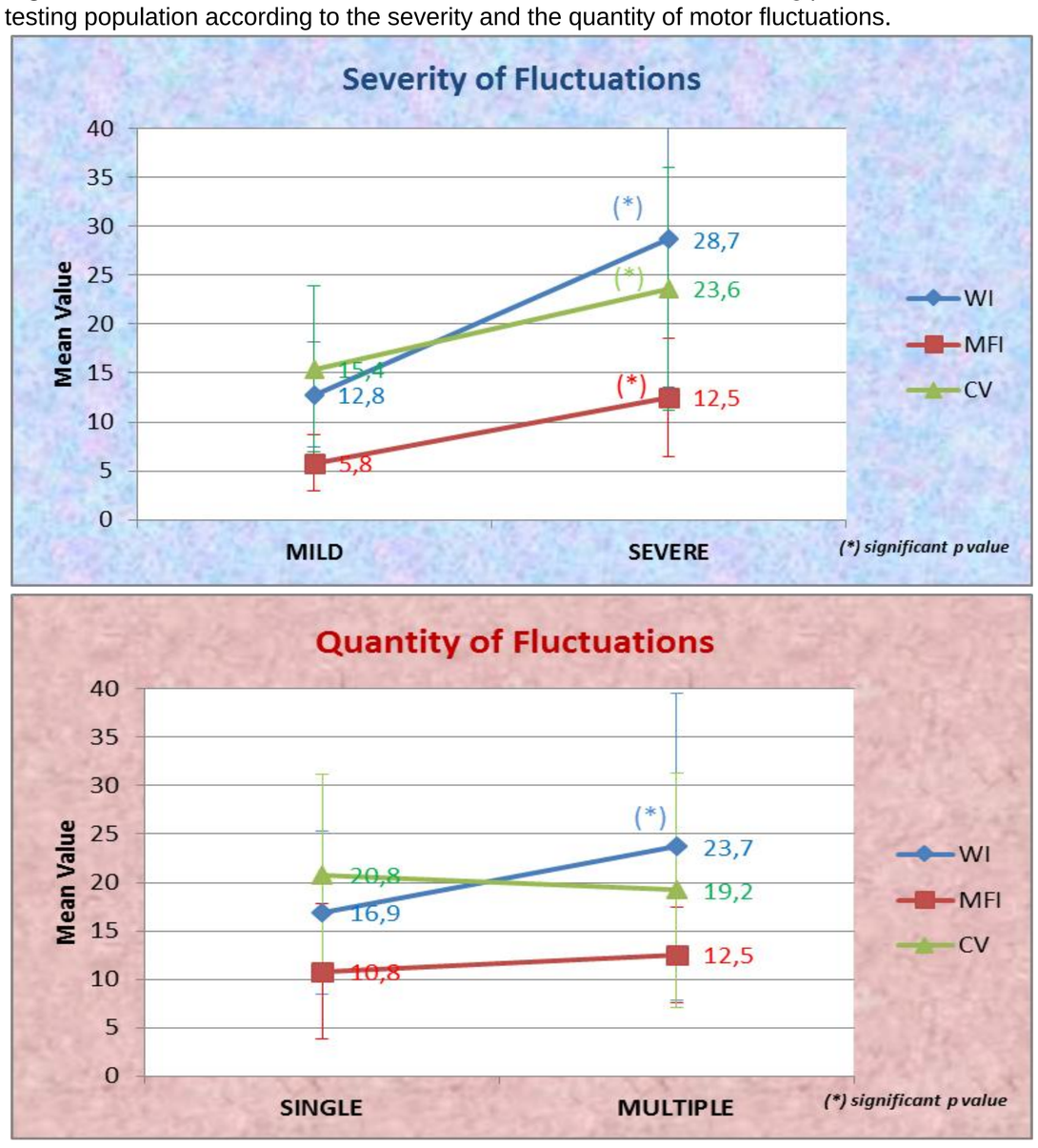
Cut-offs accuracy and clinical characteristics of fluctuating patients of the testing population are shown in Figures 2 and 3.

Fig. 2. Diagnostic accuracy of Motor Fluctuation Indices in 109 patients with Parkinson's disease (testing population).



The capability to differentiate stable from fluctuating patients by the identified cut-off values showed the highest sensitivity for the WI (91.2%), the highest specificity for the CV (95.1%), and the MFI had intermediate values of sensitivity and specificity.

Fig. 3. Clinical characteristics and Motor Fluctuation Indices in fluctuating patients of the testing population according to the severity and the quantity of motor fluctuations.



Patients with larger magnitude of fluctuations had higher values for all three indices, whereas patients with multiple daily fluctuations presented only higher WI values.

4.Conclusions

Our study proved that the WI, the MFI and the CV represent sensitive and reliable indices of motor status giving a specific and quantitative estimation of motor fluctuations in complicated PD.

References

1. Raciti L et al. Validation of the UPDRS section IV for motor fluctuations detection in Parkinson's disease. Parkinsonism Relat Disord. 2016; 27:98-101.
2. Gibb WR et al. The relevance of the Lewy body to the pathogenesis of idiopathic Parkinson's disease. JNeurol Neurosurg Psychiatry. 1988;51(6):745-52.
3. Stacy M et al. End-of-dose wearing off in Parkinson disease: a 9-question survey assessment. Clin Neuropharmacol. 2006 Nov-Dec;29(6):312-21.
4. Fahn S, Elton RL and the Members of the UPDRS Development Committee. Unified Parkinson's Disease Rating Scale. In: Fahn S, Marsden CD, Calne DB, eds. Recent developments in Parkinson's disease. London: Macmillan 1987: 153-163.