Motor Fluctuations Indices in Parkinson’s disease

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1. Introduction:
Motor fluctuations are routinely identified in Parkinson’s disease (PD) by clinical scales and self-reported tools1 whose short-cut and subjective nature of evaluation affects diagnostic accuracy of motor status. Thus, the objective long-term observation by the 12-hours Waking-day Motor Assessment (WDMA) could be considered an appropriate tool for the clinical detection of motor deterioration. WDMA-based indices may be proposed to specifically quantify motor fluctuations.

2. Materials and Methods:

Study samples
Two independent samples of N=51 and N=109 PD subjects were included in the study. All patients satisfied the UK Brain Bank criteria2 and were being treated with L-Dopa therapy. Demographic and clinical information on all patients were collected. Cognitive abilities were investigated with the Mini Mental State Examination (MMSE) using a cut-off of 24 or lower to define the cognitive impairment3.

Motor assessment
All patients were evaluated every 2 hours by a WDMA using the motor part of the UPDRS-III. Motor scores were reported as graphs. Six blinded raters, expert in Movement disorders, classified the 51 patients with or without motor fluctuations. To quantify motor fluctuations, a Worsening Index (WI), a Mean Fluctuation Index (MFI) and a Coefficient of Variation (CV) were computed based on variations in UPDRS-ME values (U). The optimal cut-off of each index was calculated. Indices cut-off accuracy was then tested in the N=109 sample.

Statistical analysis
All data were analyzed using STATA 12.1 software. We described all quantitative variables as mean ± standard deviation (SD), besides categorical variables were described using frequency. Difference between means was estimated by the Chi-square test. Cut-offs values were studied by the Receiver Operating Characteristic (ROC) using physicians’ evaluation of WDMA as gold standard. Only those patients with at least 5 out of 6 inter-rater agreement on presence or absence of fluctuation were selected for the analysis. Cohen’s kappa was also calculated to measure the inter-rater agreement. 95% Confidence Intervals (CI) of sensitivity and specificity were as well computed.

3. Results

Cut-offs’ identification
In 51 PD patients sample, indices’ optimal cut-offs calculated by using the ROC curve analysis were 8.3 for the WI, 5 for the MFI and 12.9 for the CV. The cut-offs were selected by identifying the values with the highest efficiency.

Indices’ validation
Accuracy of the cut-offs verified in the 109-study population showed a sensitivity and a specificity of 97.9% (95%CI: 94.8 to 100) and 94.3% (95%CI: 81.4 to 97.5) for the WI, 87.5% (95%CI: 80.4 to 94.6) and 94.3% (95%CI: 89.3 to 99.3) for the MFI, 81.3% (95%CI: 72.9 to 88.6) and 100% (95%CI: 99.9 to 100) for the CV.

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

XLVI CONGRESSO NAZIONALE
10-13 OTTOBRE 2015 – GENOVA