P133

The possible interplay between speech acoustic parameters and axial motor impairment in advanced Parkinson's disease patients

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Introduction: The relationship between speech parameters, axial symptoms and disease severity in Parkinson's disease (PD) patients is still unclear. Moreover, the effects of dopaminergic treatment on speech parameters are debated.

Objective: To evaluate possible correlations between axial motor features, disease severity and speech parameters in advanced PD patients and to examine chronic dopaminergic treatment effects on speech disturbances.

Methods: Retrospective data from 50 advanced PD patients in OFF- and ON-states were considered. Perceptual and acoustic analysis of spontaneous monologue and sustained phonation, including quantitative parameters and speech intelligibility rate, were performed in OFF- and ON-conditions. UPDRS part III score and subscores [Postural Instability Gait Disorder (PIGD) composite subscore] and Hoehn and Yahr scale (H&Y) were also applied. Statistical analysis was performed using Spearman correlation coefficient and Mann-Whitney test to compare groups.

Results: In ON-state PIGD subscore correlated positively with dysfluency score ($p=0.04$) and negatively with speech intelligibility rate ($p<0.01$). Patients presenting freezing of gait (FOG) had lower speech intelligibility rate compared to patients without FOG ($p=0.05$) meaning that patients with higher axial impairment after levodopa intake were more disfluent and less intelligible. In the OFF-state, H&Y score correlated negatively with maximum phonation time (MPT) of sustained phonation and speech intelligibility rate ($p=0.01$ and $p=0.04$ respectively), meaning that more severe PD patients had poorer speech quality. In the OFF- and ON-conditions, patients with speech dysfluencies had longer levodopa treatment duration than patient without speech dysfluencies (OFF:$p=0.03$; ON:$p=0.04$), regardless of levodopa equivalent dose (LED) and disease duration.

Conclusions: We confirm the possible correlation between speech and axial symptoms in advanced PD. MPT and speech intelligibility rate correlated with disease severity, suggesting their possible role as markers of disease severity. Patients with speech disfluencies had longer history of dopaminergic treatment, but not necessarily longer disease duration or higher LED than patients without disfluencies.