Examination of lalopathy and cognitive function in Parkinson's disease-associated diseases

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Abstract

We conducted sound analysis on the utterances of patients with Parkinson's disease (PD) or progressive supranuclear palsy (PSP). The subjects were 12 patients with PD, 12 patients with PSP, and 12 normal control subjects. We assessed the cognitive function using mini mental scale examination (MMSE) and frontal assessment battery (FAB). The association of cognitive function and the long silence section of oral diadockokinesis, extension of the long silence section was analyzed by Peason's correlation coefficient test. MMSE did not have the significant difference between PD and PSP. FAB significantly decreased in PSP from PD. The long silence section in patients with PSP showed more delayed than that of patients with PD in <ta> pronunciation. No significant correlation was found in the correlation between long silence section and mental function scored by MMSE and FAB in PD and PSP.

Keywords: PSP, stammering symptom, freezing of gait, MRI, SPECT, PSP-PAGF

Introduction

Parkinson's disease (PD)-associated syndrome is characterized by progressive neurodegeneration in the basal ganglia, including PD, progressive supranuclear palsy (PSP) and corticobasal degeneration. This syndrome merges various kinds of motor and mental manifestations. In Parkinson's disease in particular, the utterance of the patients becomes monotonous, and they speak in a low voice [1-3]. However, there has been insufficient research into the mechanism. We conducted sound analysis on the utterances of patients with PD or PSP.

Subjects and methods

The subjects were 12 patients with PD, and 12 patients with PSP who went to hospital for the purpose of rehabilitation. In addition there were 12 healthy control subjects (Table 1). Utterance continuance, oral diadochokinesis and reading aloud of sentences were recorded. Sound analysis was conducted using an analysis system, AccousticCore 8 (Arcadia, Inc., Osaka, Japan). In the analysis of the utterance continuance, the longest phonation time (MPT) was measured (Figure 1A). A sound pressure level every one second was measured until ten seconds after (Figure 1B). In the oral diadochokinesis analysis, the number of

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times that /pa/, /ta/, /ka/, /pataka/ were pronounced in five seconds was measured (Figure 1C). The sound pressure level of the first 10 words and a word at 5 seconds were measured (Figure 1D). Also we measured a long silence ward interval (Figure 1E). In the reading aloud analysis of the sentence, time was measured (Figure 1F). The prefix of each sentence and the sound pressure level of the ending of the words were measured (Figure 1F).

In the present study, we assessed the cognitive function using mini mental scale examination (MMSE) and frontal assessment battery (FAB). The association of cognitive function and the long silence section of oral diadockokinesis, extension of the long silence section was analyzed by Peason's correlation coefficient test.

Results

In the results of cognitive function test (Figure 2), MMSE did not have the significant difference between PD and PSP. FAB significantly decreased in PSP from PD. As to the long silence section in PD and PSP, significant difference was found in <ta> pronunciation (Figure 3). No significant correlation was found in the correlation between long silence section and mental function scored by MMSE and FAB in Parkinson's disease (PD) and progressive supranuclear palsy (PSP) (Figure 4).

Discussion

The first symptoms in two-thirds of the cases of PSP are: loss of balance, lunging forward when mobilizing, fast walking, bumping into objects or people, and falls [4]. Other common early symptoms are changes in personality, general slowing of movement and visual symptoms. Postural instability and gait impairment are the most important disorders in the early phases of the disease. The PSP subject shows a short, shuffling stepped gait, gait freezing, lurching, unsteady gait or spontaneous falls [4]. The most common problem of PSP is postural instability and frequent falls, followed by dysarthria as the second most common symptom, and bradykinesia as the third. This study would help elucidation of the pathophysiological mechanism of PSP.

References

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Table 1. Summary of subjects

	Number	Hoehn & Yahr stage	Age	Disease duration
Parkinson's Disease	12	3.1	67.6±4.6	6.8±2.6
Progressive Supranuclear Palsy	12	-	70.6±5.3	4.5±2.9
Normal Control	12	-	-	-

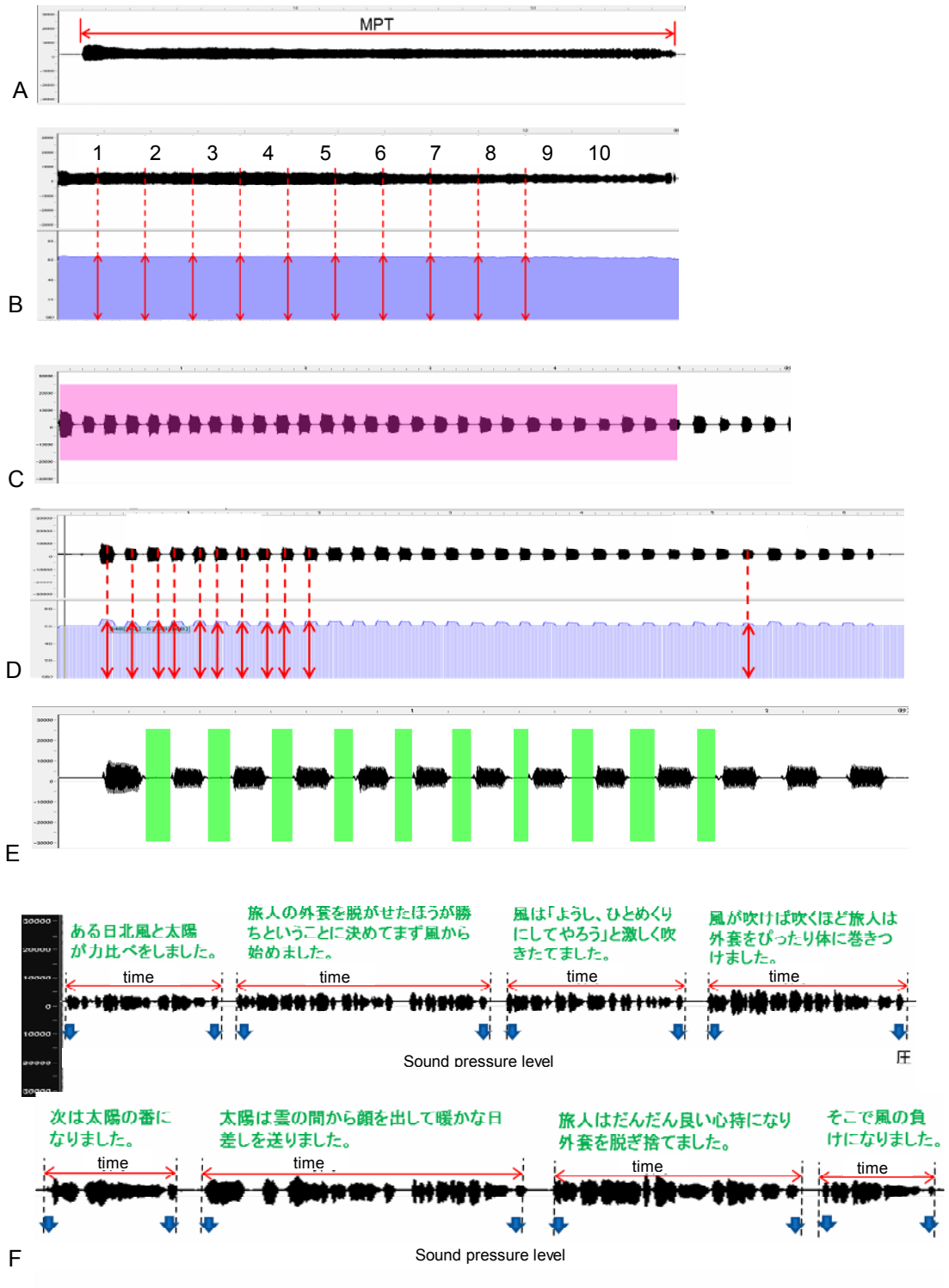

Figure 1. Analysis of the utterance continuance. A. Most longest phonation time
B. Sound pressure level every one second. C. Oral diadochokinesis analysis. The number of times of /pa/, /ta/, /ka/, /pataka/ pronounced for five seconds were measured. D. Sound pressure level of first 10 words and a word at 5 seconds were measured.

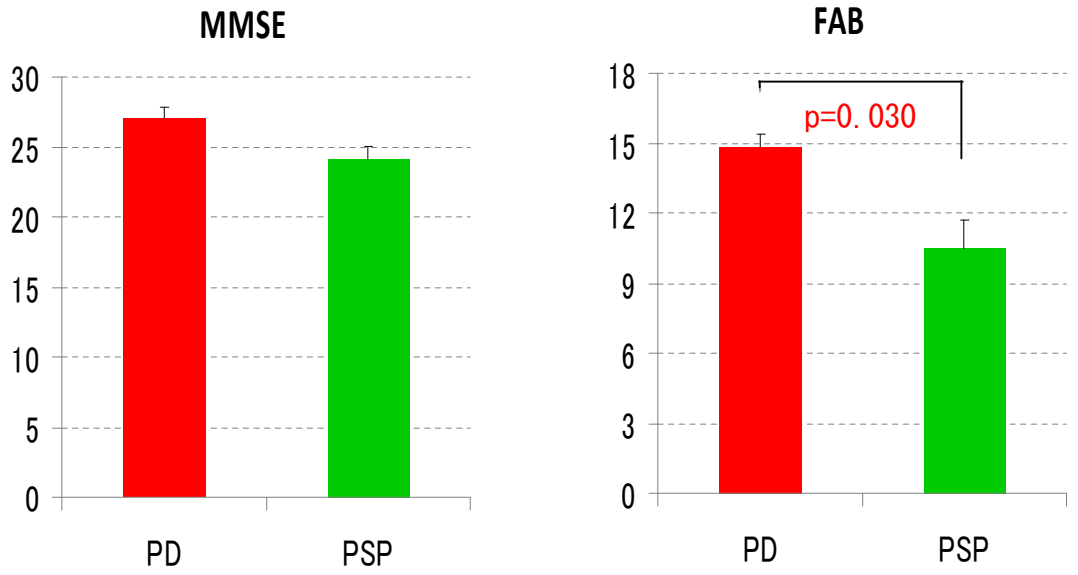

Figure 2. By the cognitive function test, MMSE did not have the significant difference between Parkinson's disease (PD) and progressive supranuclear palsy (PSP). FAB significantly decreased in PSP from PD.

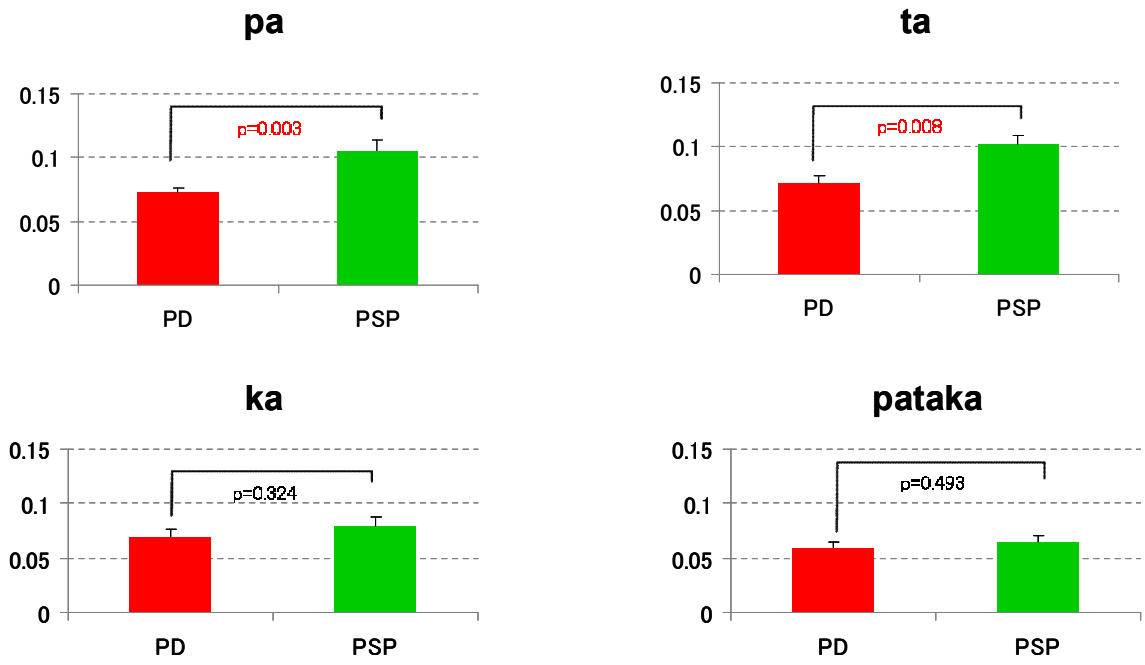

Figure 3. Long silence section in Parkinson's disease (PD), progressive supranuclear palsy (PSP) and control subjects. Significant difference was found in <ta> pronunciation.

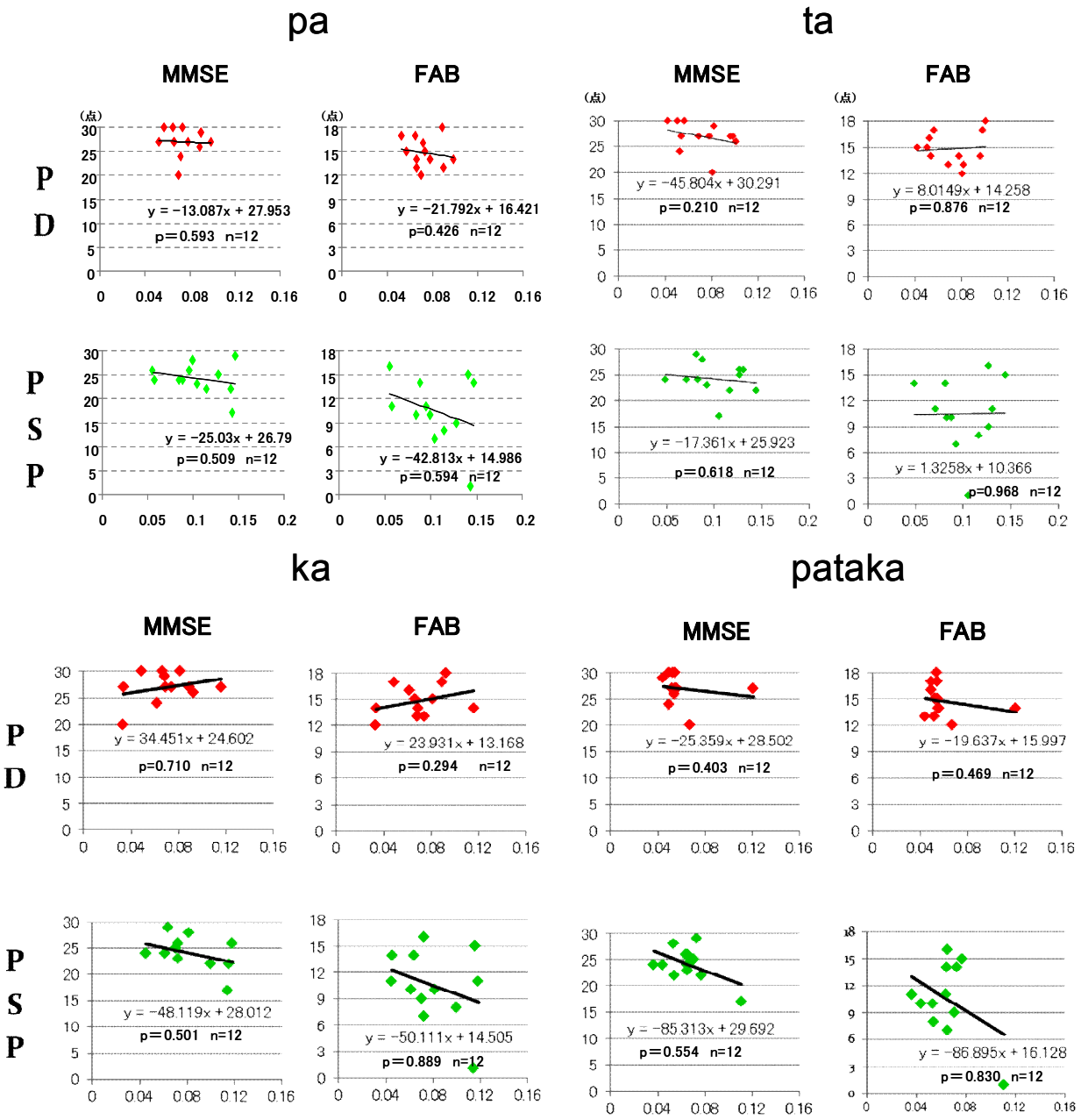

Figure 4. Correlation between long silence section and mental function scored by MMSE and FAB in Parkinson's disease (PD) and progressive supranuclear palsy (PSP). No significant correlation was found.