Movement Disorders
CLINICAL PRACTICE
CASE REPORT

A Case of Apraxic Agraphia in a Patient With Progressive Supranuclear Palsy

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Apraxic agraphia is an acquired writing disorder following disruption of skilled movement plans of writing that cannot be attributed to sensorimotor dysfunction. Thus, patients are unable to execute the sequence of strokes necessary to produce the letter form specified by the allographic code.[1] Apraxic agraphia has been described in cortical degenerative diseases, such as Alzheimer's Disease (AD) and corticobasal syndrome (CBS),[2,3] but it has never been reported in PSP even if CBS and PSP could share some clinical aspects. Here, we report on a case of a patient with a classic PSP phenotype who developed apraxic agraphia.

Case Report

The patient was a 63-year-old right-handed male typographer with 5 years of education and no family history of neurodegenerative disorders.

In 2011, he experienced progressive gait disturbance and poor balance with frequent falls. A single-photon emission computed tomography with dopamine transporter scan revealed a severe bilateral decrease in presynaptic dopamine reuptake. A diagnosis of parkinsonian syndrome was made, and levodopa up to 750 mg per day was given without improvement of clinical conditions that progressively worsened, with development of dysphagia, forgetfulness, slowing of thought processes, and emotional and personality changes with impulsivity and irritability. Moreover, handwriting became incomprehensible. The patient was admitted to our clinic in December 2012.

Neurological examination showed small-steps gait with reduced arm swing and severe impaired postural reflexes, hypomimic face, hypophonic and festinated speech, down gaze palsy, and slowed horizontal saccades. The doll's head maneuver demonstrated the supranuclear origin of the gaze palsy. He also presented neck rigidity and diffuse bradykinesia. Frontal release and applause signs were present.

The patient underwent a neuropsychological evaluation showing an impairment of executive functions, as documented by Frontal Assessment Battery (FAB) and Controlled Oral Word Association Test (COWAT) scores, and constructional praxis together with a mild verbal memory deficit (Table 1). Ideomotor apraxia was absent. Spontaneous speech was characterized by palilalia and echolalia. Comprehension, reading, and repetition were normal, but reduced verbal fluency (phonological, semantic, and grammatical criteria) was present. Both numbers and words writing to dictation were impossible because the patient produced incomprehensible scrawls, but spelling was preserved. Grapheme formation improved during copy. There was no change in quality when the patient wrote with the nondominant left hand. However, legibility got better when the patient wrote uppercase letters (Fig. 1). These features were suggestive of apraxic agraphia.[4]

An MRI showed mild cortical atrophy and severe midbrain atrophy with an area of 72 mm^2. The magnetic resonance parkinsonism index was 19, a value noted in patients with PSP.[5]

Cerebrospinal fluid levels of amyloid β 1-42 protein (Aβ), total tau protein (t-tau), and phosphorylated tau-181 protein (p-tau) ruled out AD (Aβ 428 pg/mL, t-tau 250 pg/mL, and p-tau 24 pg/mL).

The search for peculiar isoforms of tau protein and calculation of tau ratio were not done.[6]

Microtubule-associated protein tau and progranulin (GRN) genes mutational analysis did not show any gene mutations.

According to the clinical diagnostic criteria, a diagnosis of probable PSP was made.[7]

Discussion

Apraxic agraphia is a writing disorder that affects conversion of orthographic information into neuromuscular commands for handwriting movements. Illegible graphemes in writing unexplained by sensorimotor dysfunction, improvement of grapheme production with copying, preserved oral spelling, and incorrect stroke sequences on writing characterize this disorder. The neural network responsible for writing includes

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TABLE 1 Standardized neuropsychological battery

Neuropsychological Tests		n.v.
MMSE	25.2[a]	>24
FAB	11.8[a]	≥13.4
Hamilton rating scale for depression	9	<15
RAVLT immediate recall	27.4[a]	≥28.53
RAVLT delayed recall	2.2[a]	≥4.69
Constructional praxis – figure copy	5.9[a]	≥7.18
Constructional praxis – figure completation	57.2[a]	≥61.85
Ideomotor apraxia dx and sx	>62	>62
COWAT	12.3[a]	≥17.35
TMT–A (s)	51[a]	<93
TMT–B (s)	89[a]	<282
TMT–B-A (s)	38[a]	<186
Stroop test (s)	30[a]	≤36.92
Stroop errors	3.7[a]	≤4.24

[a]Age- and education-adjusted score.
MMSE, Mini–Mental State Examination; RAVLT, Rey Auditory Verbal Learning Test; TMT, Trail Making Test; n.v., normal value.

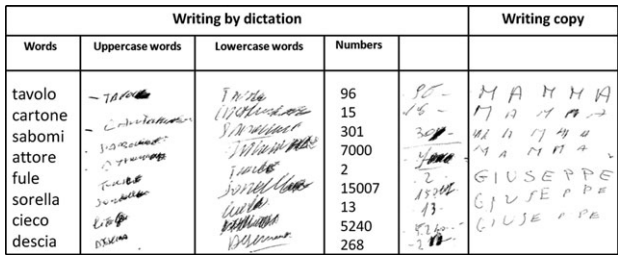

Figure 1 Words written under dictation appear unreadable, even though the spelling is preserved. Formation of graphemes improves with copying. Words are more readable when the patient writes in capital letters.

dominant and nondominant parietal lobe, the dominant frontal lobe, the dominant thalamus, and cerebellum.[8] To date, apraxic agraphia has never been reported in patients with PSP, which, however, could exhibit apraxia of speech.[9] Previously, the association between PSP and graphic disorders was pointed out by Podoll et al.[10] They explored language functions in 6 patients with clinically diagnosed PSP and observed a deterioration of graphic performance in all their patients. Handwriting was characterized by dysgraphic errors as omissions, perseverations, and substitutions of letters or words. They assumed that these errors were the result of visuoconstructional disabilities and classified the writing disturbance as constructional dysgraphia, a form of spatial agraphia whose feature is disorganization of the written material and lines.[11] On the contrary, our patient did not exhibit features of constructional dysgraphia, but illegible graphemes in writing on dictation and preserved grapheme formation during copy were evident, as reported in apraxic agraphia without ideomotor apraxia.[1,2] In addition, there was no evidence of an abnormal reduction of writing size, such as observed in micrographia of patients with Parkinson's disease.

The clinical diagnosis of PSP and CBS is challenging because of overlapping clinical features.[12] On admission, our patient showed a classical PSP phenotype that remained unchanged at follow-up, although the histopathological diagnosis of PSP was not available. Moreover, laboratory findings excluded AD and GRN mutation, conditions previously associated with apraxic agraphia.[2,3] To our knowledge, this is the first description of apraxic agraphia in PSP, thus expanding the spectrum of clinical phenotypes associated with this writing disorder.

Author Roles

(1) Research Project: A. Conception, B. Organization, C. Execution; (2) Statistical Analysis: A. Design, B. Execution, C. Review and Critique; (3) Manuscript Preparation: A. Writing of the First Draft, B. Review and Critique.

G.S.: 2B, 3A
T.M.: 2B, 3A
G.M.: 1C
M.L.C.: 1C
A.L.: 1C
L.R.: 1C
C.S.: 1C
F.L.P.: 2B
A.N.: 2B, 2C
M.Z.: 3A

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