

Idiopathic basal ganglia calcification may cause pathological conditions resembling Parkinson's disease

Dear Editor,

Idiopathic basal ganglia calcification (IBGC) is characterized by the calcification of the bilateral basal ganglia and cerebellum. Recently, *SLC20A2*, *PDGFRB*, *PDGFB*, *XPRI*, and *MYORG* mutations have been reported in hereditary IBGC [1]. The pathophysiological basis inferred from the gene mutation is the impaired transport of inorganic phosphate (Pi) in and out of the cells in the brain [2]. IBGC frequently presents with parkinsonism and involuntary movements [3], but the pathophysiology of parkinsonism and the involvement of impaired Pi transport is unclear. ¹²³I-metaiodobenzylguanidine (MIBG) myocardial scintigraphy is widely used in Japan as a sensitive biomarker for Lewy body diseases such as Parkinson's disease (PD) [4]. We report a case of IBGC demonstrating parkinsonism and its ¹²³I-MIBG myocardial scintigraphy findings, and present a review of the previous reports of such cases.

1. Case report

A 79-year-old woman was admitted to our hospital due to an involuntary movement in her limbs. Her medical history included hypertension and she had been suffering from severe constipation since the age of 60 years old. As she was adopted in childhood, details of her family history were unknown. She developed postural tremor of the hands at 72 years of age. In the next year, she had a gait disturbance (short-stepped gait, freezing of gait) and a tendency to fall, so she visited the family doctor.

She was diagnosed with PD given her akinesia and rigidity in the extremities in addition to tremor. She was started on L-dopa and her symptoms improved after the dose was increased to 600 mg/day. At 78 years of age, the involuntary movement of her mouth and extremities became prominent, and she was brought to our hospital.

On physical examination, no abnormalities were observed except for persistent involuntary movements. Orientation and recent memory function were impaired and her Mini-Mental State Examination score was 18. Orofacial dyskinesia and limb athetosis were present, and her gait was unstable due to involuntary movements. Tremor and rigidity of the extremities were not clear. Routine biochemical blood tests were normal. Moreover, the serum concentrations of Ca (8.7 mg/dl), Pi (3.5 mg/dl), and parathyroid hormone were within normal limits. A routine cerebrospinal fluid (CSF) analysis revealed normal results but elevated levels of Pi (present case: 2.3 mg/dl vs control: 1.3 ± 0.2 , mean \pm SD) [2]. Brain computed tomography (CT) revealed high density in the basal ganglia and dentate nucleus. Low intensity areas were observed in the basal ganglia by T2-weighted magnetic resonance imaging (MRI). Her MRI T2*-weighted image clearly showed low intensity in the basal ganglia and dentate nucleus. Fused image of the dopamine transporter (DAT) single-photon emission computed tomography (SPECT) using

¹²³I-ioflupane (DAT-SPECT) revealed diffusely decreased DAT density in the calcified regions. ¹²³I-Iomazenil SPECT examination revealed reduced blood flow in the frontal lobes (Fig. 1). ¹²³I-MIBG myocardial scintigraphy revealed reduced heart-to-mediastinum (H/M) ratios (early phase, 2.19; delayed phase, 1.89) of MIBG uptake.

2. Discussion

In the present case, parkinsonism, mouth and limb dyskinesias, and dementia were observed. Brain images revealed calcification in the basal ganglia, and hormonal examination revealed no parathyroid dysfunction. IBGC has often been reported to exhibit parkinsonism. It has also been reported to be associated with orofacial dysfunction, involuntary movements such as dystonia and athetosis [3].

Recently, IBGC has been shown to have elevated levels of Pi in the CSF and was reported to be a biomarker for IBGC [2]. Pi in the CSF was as high as 2.3 mg/dl in this case. As the Pi level in the CSF was high, impaired transport of Pi was speculated. These results suggested this to be an IBGC case.

The present case had dopa-responsive parkinsonism, decreased DAT density in the bilateral striatum suggestive of presynaptic dopaminergic dysfunction. Furthermore, ¹²³I-MIBG uptake in the ¹²³I-MIBG myocardial scintigraphy had decreased H/M ratio in the delayed phase. Reduced uptake of ¹²³I-MIBG suggested Lewy body disease such as Parkinson's disease.

Therefore, the present case should be considered for the coexistence of IBGC and PD. Additionally, Lewy body pathology in autopsy cases of IBGC have been reported. [5] The combination of IBGC and PD may be considered coincidental, as PD is a common in elderly patients. There are eight cases of patients with IBGC with parkinsonism who were examined using DAT-SPECT and/or ¹²³I-MIBG scintigraphy, including the present case, in the literature. [6–10] DAT density decreased in six of the eight cases (75%) and ¹²³I-MIBG uptake reduced in four of the six cases (67%). These findings cannot be explained based on basal ganglia calcification alone, and PD pathology is presumed to frequently occur in IBGC. The high incidence of PD in IBGC suggests them as not just a coincidental association. IBGC itself may cause pathological conditions resembling PD.

Cognitive decline was also suggested in the present case, and ¹²³I-Iomazenil SPECT confirmed bilateral frontal lobe hypoperfusion. It is possible that dysfunction of the dopamine system due to bilateral striatal calcification and impairment of the cortico-subcortical circuit contributes to the decline in the frontal lobe function.

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Declaration of competing interest

None.

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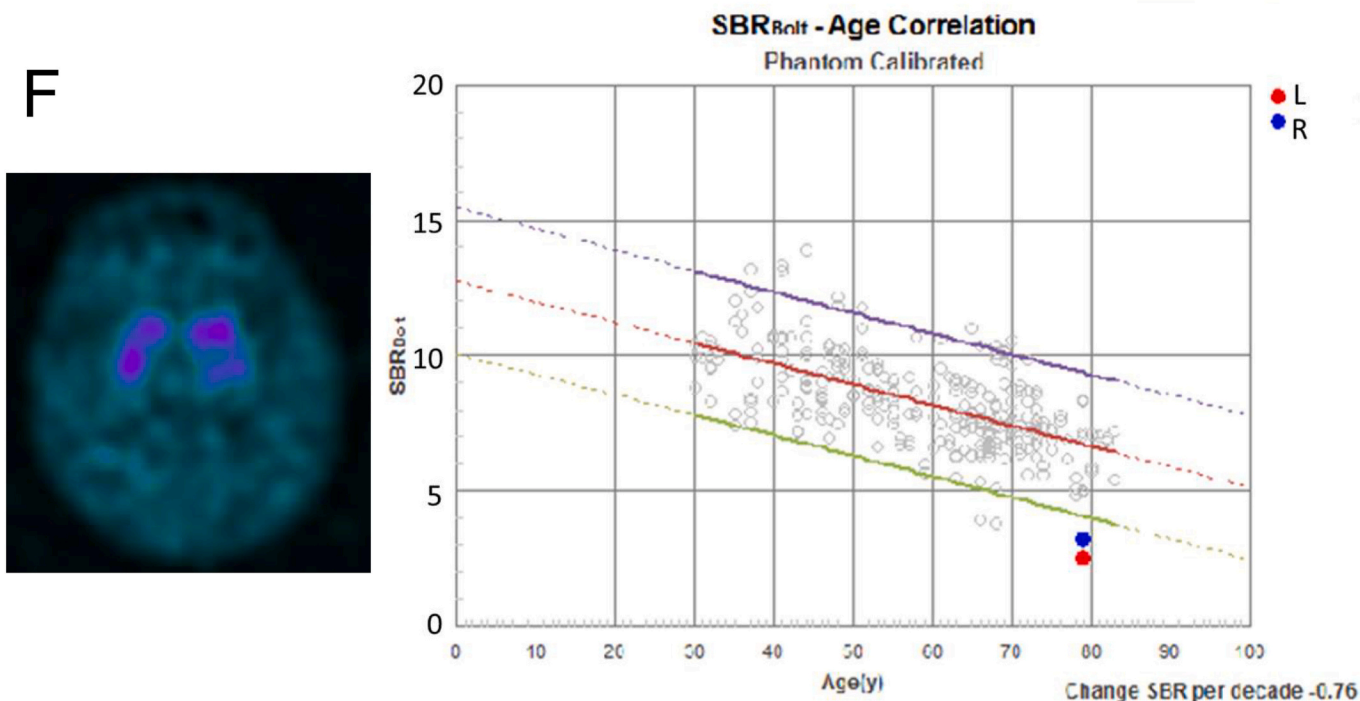
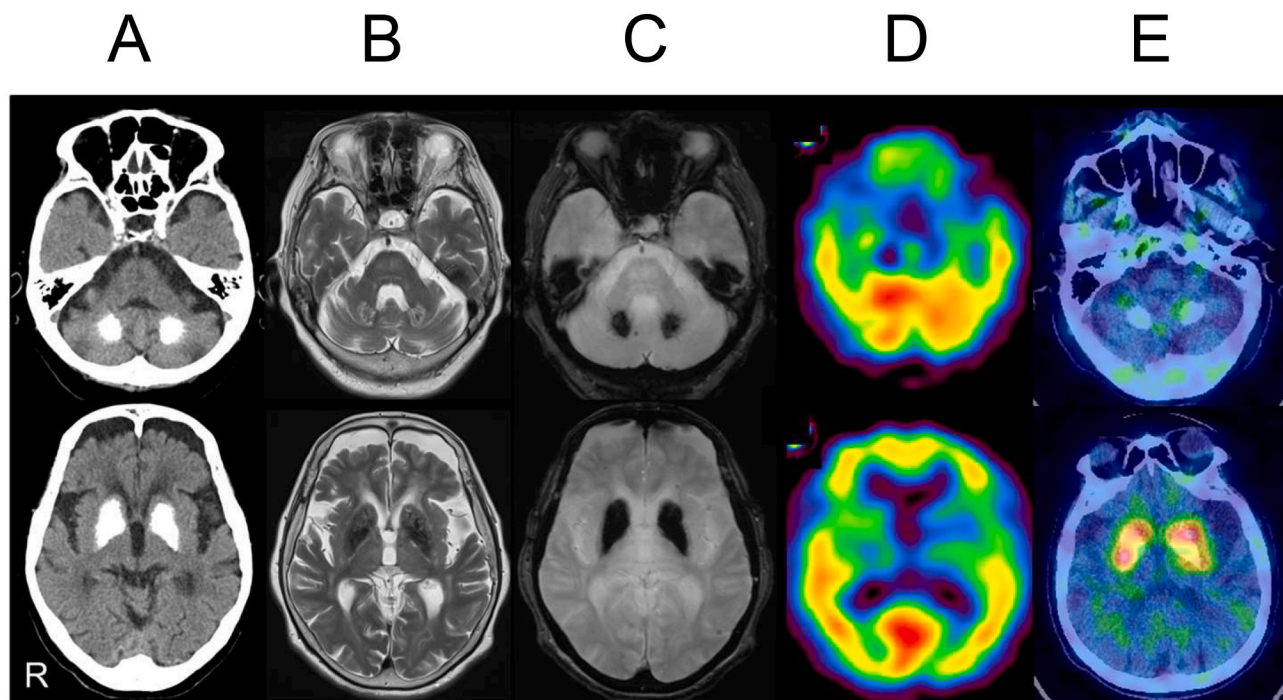


Fig. 1. Brain computed tomography showed bilateral calcification in the basal ganglia and cerebellar dentate nuclei (A). Magnetic resonance imaging disclosed the same area as slightly high signal in the T2-weighted image (B) and clear low signal in the T2*-weighted image (C). ¹²³I-Iomazenil single photon emission computed tomography (SPECT) revealed hypoperfusion regional blood flow in the bilateral frontal lobe (D). Fused image of dopamine transporter (DAT) SPECT using ¹²³I-ioflupane (DAT-SPECT) showed diffusely decreased DAT density in the calcified regions (E). The specific binding ratios (SBRs) of both striatum were 3.21 (right) and 2.54 (left) (F).

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