## Hemichorea-hemiballism caused by arteriovenous malformations in the putamen

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Sirs: Involuntary movements have rarely been reported in association with arteriovenous malformations [2, 4–7] and venous angiomas [1]. We have recently experienced a patient with arteriovenous malformations mainly located in the putamen, who gradually developed hemichorea-hemiballism. This is the first reported case of hemichorea-hemiballism caused by an arteriovenous malformation.

A 66-year-old woman had been in good health until 1.5 years before her admission, when she had noticed transient weakness of her left leg that interrupted her gait. She had also noticed gradually developing choreiform and intermittently ballistic movements of her left arm. One year later, she had noticed dysarthria and irregular uncontrollable jerky movements of her left lower extremity, which were more marked in proximal than distal muscles. During the next several months, the movements became constant and more violent. Psychological stress or resting posture made the symptoms worse. There were no episodes of sudden worsening or previous history of loss of consciousness, headaches, seizures or other focal symptoms.

On admission, the general physical findings were normal. Neurological examination showed the patient to be alert with slight dysarthria. There were marked choreiform movements of the entire left side including the face, with greatest amplitude and frequency in the leg. Ballistic movements of the left arm and leg were intermittently observed. These movements disappeared during her sleep and worsened by the psychological stress or resting posture. Muscular strength and



Fig. 1. Computed tomographic scan showing a micronodular high-density area ranging from the right putamen to the insula (A) and contrast enhancement around the area (A')

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tendon reflexes were normal. The plantar responses were flexor bilaterally. Sensation, cerebellar function and autonomic nervous system were normal. The pulses over the skull and neck were symmetrical, without bruits.

The results of routine laboratory tests were normal. A computed tomographic scan showed a micronodular high-density area ranging from the right putamen to the insula and intravenously injected contrast medium enhanced its surrounding area (Fig. 1). Cerebral angiography demonstrated no abnormalities but magnetic resonance imaging (long spin echo image) disclosed a high signal area corresponding to the enhanced lesion in the computed tomographic scan. These findings indicated vascular malformations mainly located in the right putamen without haemorrhage or infarction.

Surgical approach via a right fronto-temporal flap was carried out and the vascular malformations were excised. Histopathological examination revealed the characteristic pictures of arteriovenous malformations. Postoperatively, the involuntary movements of hemichorea-hemiballism type became markedly relieved.

There have been ten reported cases of involuntary movements secondary to vascular malformations [1, 2, 4–7]. None presented with choreiform or ballistic movements, except for the case of venous angioma in the caudate nucleus reported by Burke et al. [1].

The movement disorder in our patient did not develop suddenly, as would be expected from a haemorrhage or infarction. The slowly progressive course of the symptoms and the dramatic relief of involuntary movements after the excision suggest that the involuntary movements were caused by a direct mass effect of the arteriovenous malformations on the surrounding neural parenchyma, possibly the globus pallidus. The hemichorea-hemiballism could have been secondary to the mass effect of the arteriovenous malformation in the putamen reducing the inhibitory outflow from the putamen to the globus pallidus [3].

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