

Case Report

Oro-mandibular dystonia in pediatric moyamoya disease: Two cases report

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ABSTRACT

Background: In this report, we describe rare two pediatric cases that developed oro-mandibular dystonia due to moyamoya disease.

Case Description: A 7-year-old boy presented with oro-mandibular dystonia and transient weakness of the left extremities, and was diagnosed as moyamoya disease. Another 7-year-old boy developed oro-mandibular dystonia alone and was diagnosed as moyamoya disease. In both, cerebral blood flow (CBF) was markedly decreased in the involved hemispheres, including the basal ganglia and cerebral cortex. They successfully underwent combined bypass surgery and experienced no further attacks of oromandibular dystonia during follow-up periods. CBF almost normalized through surgical collaterals through direct and indirect bypass.

Conclusion: When treating patients with oro-mandibular dystonia, moyamoya disease should be listed as one of the differential diseases. The underlying mechanism of oro-mandibular dystonia in moyamoya disease is still unclear, but persistent cerebral ischemia in the basal ganglia and/or parietal lobe may play a key role to induce this rare symptom.

Keywords: Bypass surgery, Cerebral blood flow, Involuntary movement, Moyamoya disease, Oromandibular dystonia

INTRODUCTION

Moyamoya disease causes various presentations, but most of the pediatric patients develop transient ischemic attack (TIA) and ischemic stroke.^[7,18] Involuntary movements are the most uncommon among all which only 1–6% of patients develop in their initial presentation or clinical course. Symptoms usually include chorea, dystonia, and/or dyskinesia, although the underlying mechanisms are not fully understood.^[1,3,6,11,16]

This report first describes two pediatric cases of moyamoya disease that manifested involuntary movements in the oro-mandibular area.

CASE DESCRIPTION

Case 1

A 7-year-old boy suddenly experienced transient loss of the ability to close his mouth while he was eating. This symptom of jaw opening lasted for about 5 min, followed by transient weakness of the

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left extremities for a few minutes. Neurological examination on admission revealed no abnormalities. No parenchymal lesions were observed on FLAIR image. MRA and cerebral angiography showed the narrowing of the carotid forks and their branches on both sides. SPECT demonstrated a marked decrease in cerebral blood flow (CBF), including the striatum and cortex, in the right cerebral hemisphere [Figure 1]. He was diagnosed as moyamoya disease and successfully underwent superficial temporal artery to middle cerebral artery (STA-MCA) anastomosis combined with indirect bypass, encephalo-duro-myo-arterio-pericranial synangiosis (EDMAPS) onto the right hemisphere.^[8,9] Follow-up cerebral angiography taken 4 months after surgery revealed well-developed surgical collaterals through both direct and indirect bypass. CBF improved markedly after surgery [Figure 1]. During 1 year after surgery, he has experienced no further attack, including involuntary movements and TIA.

Case 2

A 7-year-old boy suddenly experienced involuntary movements of the jaw and tongue. Characteristically, dystonic and dyskinetic motions were seen, including jaw opening and the jaw and throat making clicking sounds. Neurological examination on admission showed no abnormalities. No parenchymal lesions were observed on FLAIR image. MRA and cerebral angiography demonstrated severe stenosis of the carotid forks on both sides. SPECT showed a decreased in CBF in the left hemisphere, including the striatum and cortex [Figure 2]. He was diagnosed as moyamoya disease and successfully underwent STA-MCA anastomosis and EDMAPS on the left side and then on the right side 3 weeks later. Follow-up cerebral angiography taken 6 months after surgery revealed well-developed surgical collaterals through both direct and indirect bypass. CBF significantly improved after surgery [Figure 2]. During these 7 years after surgery, he has experienced no further attack of involuntary movement.

DISCUSSION

In the present cases, unique movement disorder around their jaw is considered consistent to oromandibular dystonia. Dystonia is defined as involuntary lasting severe muscle contractions and is defined as oromandibular dystonia when the oral cavity such as the mouth, face, and jaw is involved.^[15]

The mechanisms of involuntary movements in moyamoya disease are still unclear, but it is most likely that the basal ganglia may be largely involved in the occurrence, where the dilated moyamoya vessels are often found.^[1] Thus, moyamoya disease may lead to profound ischemia in the basal ganglia, causing involuntary movements.^[3,14] The function of basal ganglia-thalamocortical circuit may be disturbed and extrapyramidal symptoms such as chorea, dyskinesia, and

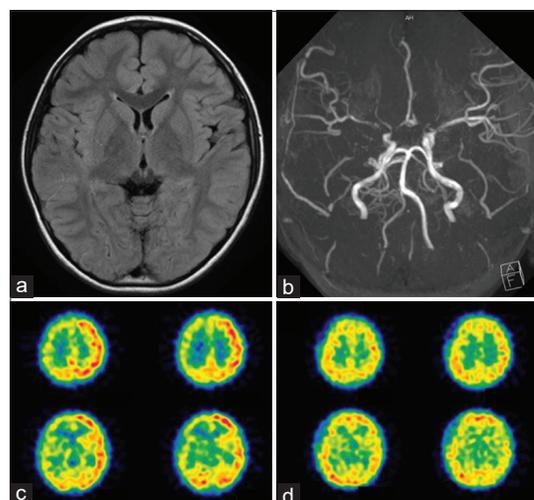


Figure 1: Radiological findings of a 7-year-old boy who developed oro-mandibular dystonia and transient ischemic attack (Case 1). (a) No parenchymal lesions were observed on FLAIR image (b) Magnetic resonance angiography showed the narrowing of the carotid forks and their branches on both sides. Moyamoya vessels were more apparent in the right side. (c) ¹²³I-IMP SPECT demonstrated a marked decrease in cerebral blood flow (CBF) on the right side, including the striatum and cortex. (d) On follow-up SPECT at 4 months after superficial temporal artery to middle cerebral artery anastomosis and encephalo-duro-myo-arterio-pericranial synang onto the right side, CBF markedly improved on the operated hemisphere.

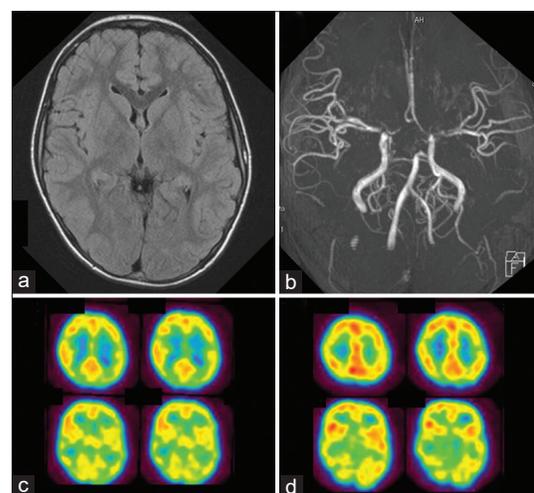


Figure 2: Radiological findings of a 7-year-old boy who developed oro-mandibular dystonia (Case 2). (a) No parenchymal lesions were observed on FLAIR image (b) Magnetic resonance angiography showed the stenosis of the carotid forks and their branches on both sides. (c) ¹²³I-IMP SPECT demonstrated a significant decrease in cerebral blood flow (CBF) on the left side, including the striatum and cortex. (d) On follow-up SPECT at 6 months after superficial temporal artery to middle cerebral artery anastomosis and encephalo-duro-myo-arterio-pericranial synang on both sides, CBF markedly improved on the operated hemispheres.

dyskinesia may develop.^[12] Furthermore, blood flow studies identified CBF reduction or impaired vascular reserve in the basal ganglia.^[3] In fact, in the two cases presented here, CBF was decreased in the basal ganglia as well as in the cerebral cortex, and involuntary movements disappeared and CBF improved after surgical revascularization.

Second, the hypertrophied moyamoya vessels in the basal ganglia may physically compress the neurons and/or the extrapyramidal tract in the basal ganglia, causing involuntary movements.^[16] However, as observed in the present cases, most of the moyamoya patients with involuntary movements had the dilated moyamoya vessels on both sides, but their involuntary movements occurred only on one side. These facts strongly suggest that many other factors may contribute to the occurrence of involuntary movements.

Finally, involuntary movement may develop through hypermetabolic state in the striatum due to the dilated moyamoya vessels. Thus, glucose metabolism was reported to increase in the striatum responsible for unilateral chorea in two pediatric patients who developed involuntary movements “after” bypass surgery, although they did not experience it before surgery.^[17] They speculated that impaired vascular autoregulation in the basal ganglia could induce this unique phenomenon. Very specific conditions such as Group A streptococcal infections, hyperthyroidism, and hyperglycemia can elevate glucose metabolism in the striatum and induce involuntary movements such as chorea.^[17]

Alternatively, recent studies have shown that dystonia is not only caused by an abnormality of the basal ganglia alone, but also by a functional impairment of other brain regions such as the cerebellum, thalamus, midbrain/brainstem, and cerebral cortex. For example, some investigators have largely focused on the cerebello-thalamo-cortical network.^[5,10] In fact, oro-mandibular dystonia can occur in a patient with cerebellar ischemic stroke.^[2] The speculation has been supported by recent neuroimaging studies, which show functional abnormalities in the cerebellum, but not in the basal ganglia, in a significant number of patients with dystonia.^[13] Especially, the parietal lobe has been the focus of attention as a region responsible for dystonia. A variety of lesions in the parietal lobe are known to induce dystonia.^[4] In Case 1, furthermore, a jaw opening attack was followed by a hemiparesis attack, strongly suggesting that both attacks were caused through cerebral ischemia in the area close to each other, i.e., parietal lobe and primary motor cortex. Previous studies have shown that the failure to process sensory information such as body positions in the parietal lobe may lead to the occurrence of dystonia.^[13] In fact, in the two cases presented here, SPECT before surgery showed extensive cerebral ischemia in the cerebral cortex including the parietal lobe. After successful

surgery, CBF markedly improved and recovered to the normal level.

CONCLUSION

We report rare two cases that developed oro-mandibular dystonia due to moyamoya disease. The underlying mechanism of oromandibular dystonia in moyamoya disease is still unclear, but persistent cerebral ischemia in the basal ganglia and/or parietal lobe may play a key role in this rare symptom.

Declaration of patient consent

Institutional Review Board (IRB) permission obtained for the study.

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Conflicts of interest

There are no conflicts of interest.

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