Artery of Percheron Occlusion in China

A Case Report and Chinese Literature Review

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The artery of Percheron (also known as AOP) was firstly described by Percheron in 1973, which indicated an anatomic variant of the paramedian arteries arising from segment P1 of the posterior cerebral artery. The critical feature of AOP is that the bilateral paramedian thalami are supplied by a single vascular branch arising from the P1 segment of the posterior cerebral artery. The exact prevalence of AOP remains unknown. However, autopsy studies revealed the occurrence of AOP could be up to 11.7% in investigated patients. The bilateral paramedian thalamic infarction because of the occlusion of the AOP is a rare type of ischemic stroke; studies found that AOP territory related infarction may approximately account for 0.29% of all ischemic strokes, 0.51% of first clinical strokes, and 2.33% of thalamic infarction. Because of the rarity and various patterns of AOP occlusion, as well as the computed tomography (CT) could be identified as normal at first, the early diagnosis could be challenging for physicians. Therefore, magnetic resonance imaging (MRI) is currently the most informative tool for early diagnosis of AOP occlusion, as well as case reports and summaries could help inform physicians of this specific type of stroke.

CASE REPORT

We received this 83-year-old woman on March 14, 2020. She was found unconscious for 1 day at home and was sent to our hospital the next day. During the inquiry about the patient’s status before the stroke, the patients’ family mentioned the patient had hypertension and diabetes and was in poor physical health for years, and the patient showed some mood disorder and language disorder before the stroke. The patient used to be optimistic but becomes more conscious but still could not speak or move. Her limbs could lift a little to nociceptive stimuli and showed a positive Babinski’s sign; although her eyes showed no obvious mydriasis or myosis, they could not perform the horizontal or vertical move. Other clinical examinations indicated the patient had atrial fibrillation, atheroma plaques, and pleural effusion; no other organ dysfunctions were found. Cerebral MRI and magnetic resonance angiography (MRA) found evident artery stenosis of the right P1 segment of the posterior cerebral artery (Figs. 1A–I), suggesting that the patient had AOP occlusion. The stroke was ascribed to embolism from atheroma plaques of the vertebrobasilar system arteries seen on the transthe An 83-year-old woman was found unconscious for 1 day at home and was sent to the hospital the next day. Cerebral magnetic resonance imaging on day 1 of the patient showed a recent bilateral paramedian thalamic infarction. Simultaneously, magnetic resonance angiography found evident artery stenosis of the right P1 segment of the posterior cerebral artery, suggesting that the patient was diagnosed with AOP occlusion. Since the patient had missed the best time for thrombolytic therapy, anticoagulant therapy was initiated immediately; as the patient was then found to have pulmonary infections, antibiotic therapy was also initiated. The neurological status of this patient improved very slow. In about 2 weeks, the patient becomes more conscious but still could not speak or move.

Conclusion: Our report suggests that unusual mood disorder and language disorder of aged patients might indicate the AOP occlusion, and cerebral imaging of magnetic resonance imaging (better with magnetic resonance angiography) should be performed to establish the diagnosis of AOP occlusion. The fast and accurate diagnosis of stroke because of AOP occlusion could best benefit the patients.

Key Words: case report, artery of percheron, paramedian thalamic infarction, midbrain infarction, stroke

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We excluded the kinds of literature that (1) the patient has thalamic or paramedian stroke history, (2) the patient has other pathogeny induced thalamic or paramedian lesion, (3) no detailed clinical data, (4) no cerebral imaging that proves to be AOP occlusion. The quantitative parameters were described as median and percentage; descriptive analyses were performed by using the R software package.9

There are 64 patients (1 of our patients and 63 patients from the literature review, Supplemental Digital Content 1, http://links.lww.com/NRL/A61) included in this study. The characteristics of patients with AOP occlusion are shown in Table 1. There were 40 men and 24 women, with a median age of 61.5 years. The co-morbidities of the patients were as follows: atrial fibrillation in 18.8%, coronary heart disease in 12.5%, diabetes in 14.1%, dyslipidemia in 9.4%, hypertension in 65.6%, myocardial infarction in 3.1%. The clinical signs were dominated by neurological signs such as coma (39.1%), confusion (31.3%), and drowsiness (43.8%); neuropsychological signs such as language disorder (18.8%), memory deficit (6.3%), arm/leg plegia (37.5%), and Babinski’s sign (46.9%) were common; importantly, ophthalmological signs could be found in half of the patients, including blurred vision (12.5%), mydriasis/myosis (35.9%), and ocular motility disorder (53.1%). All patients underwent cerebral imaging, including CT (34.4%), DSA (15.6%), MRI (96.9%), and MRA (71.9%); some patients could conduct more than 1 examination. Origin of stroke was predominantly attributed to large artery atherosclerosis in 40% and cardioembolism in 28.1%; only 10.9% of origin of stroke remained unknown. Of all the patients after therapy, only 26.6% patients have no sequelae; the most common sequelae were ocular motility disorder (32.8%) and memory deficit (32.8%), the second common sequelae were language disorder (23.4%) and mood disorder (20.3%), the less common sequelae were arm/leg plegia (6.3%).

**DISCUSSION**

Our analysis of 64 patients with AOP occlusion in China provides a detailed picture of this condition and the outcome. Although patients with AOP occlusion could resolve rapidly from the coma, other abnormalities such as ocular motility disorder, memory deficit, language disorder, mood disorder, and motor impairments might persist in the long term. In our review, the most common mechanism of infarction is large artery atherosclerosis and cardioembolism; only 10.9% remains unknown.

The AOP occlusion is a rare type of stroke in clinical patients, and males and females are equally affected. Many patients with AOP occlusion have cardiovascular risk factors or...
The midbrain “V” sign along the pial surface of the midbrain in the interpeduncular fossa is considered as a diagnostic sign for AOP occlusion, which is derived from a high-intensity signal on axial fluid-attenuated inversion recovery and diffusion-weighted imaging. This sign has been reported in 67% of patients (37 patients in total) with AOP occlusion; however, in our review, we found the midbrain “V” sign only presented in 20.9% of patients who conducted MRI (Table 1). Together with the previous studies, it is recognized that the midbrain “V” sign on diffusion-weighted imaging could help clinicians to diagnose the AOP occlusion, while patients with no midbrain “V” sign need more careful examinations to make an accurate diagnosis. In this case, 3D MRA is recommended to be coupled with MRI to rule out basilar artery occlusion. As shown in Figures 1G–I, it is clear that the right P1 segment in the posterior cerebral artery is stenosis, and according to the classification of AOP occlusion types, our patient belongs to the “bilateral paramedian thalamic with midbrain” type.

In previous studies, the cause of the AOP occlusion mainly was identified as embolic heart disease, while large artery atherosclerosis and small-artery occlusion were exceedingly rare. In our review, we found that the primary cause of the AOP occlusion was large artery atherosclerosis (40%, Table 1). This inconsistency in results may be because of the increasing high sugar/fat diet in Chinese people, which could lead to a higher rate of large artery atherosclerosis, and finally, a higher rate of stroke. A recent study has found the up growing trend of obesity in China that could relate to high sugar/fat diet, which could help to explain why large artery atherosclerosis has been the primary cause of AOP occlusion in the literature reviewed (literature covered the recent 10 years).

Thalamus could affect 5 functional aspects, such as (1) nociception, (2) receiving inputs from all major sensory domains, (3) language and motor function, (4) higher cognitive functions, and (5) motivation and mood. As a result of AOP occlusion, the patients usually have sequelae related to these aspects. In our review, only about 1/4 patients have no sequelae; the other 3/4 patients have different kinds of dysfunctions in language, motor, cognitive, and mood, similar to the previous study. Although stroke of the thalamus because of AOP occlusion is usually not fatal, patients with other co-morbidities may need more attention. As in this case, our patient had been in hypertension and bad health condition for years, and she was diagnosed to have atrial fibrillation, atheroma plaques, and pleural effusion; more importantly, the family did not realize that the mood and language disorder could be an early sign of stroke, and ascribed the unconsciousness as a bad health condition (the patient was sent to hospital 1 day later), which all eventually resulted in the miss of the best time for thrombolytic therapy, the stroke might thus aggravate her condition and threaten her life.

Ischemic stroke because of AOP occlusion is a rare type of stroke and could be life-threatening, especially when the treatment is delayed. The typical clinical signs could be similar to other ischemic stroke types; however, clinicians need to be aware of the combination of consciousness impairment, neuropsychological and ophthalmological disorders, respiratory and cardiovascular dysfunctions. Cerebral imaging of MRI (better with MRA) should be performed to establish the diagnosis of AOP occlusion, as CT could be normal initially.

There are limitations to our study. First, our study focused on introducing Chinese literature to a broader audience, which limited the number of cases collected. Second, the kinds of literature included in our study are primarily from the recent decade.
literature from earlier times usually did not have images or detailed clinical data. Thus the result may only reflect the current conditions. Finally, although limitations exist, our study also provided detailed information on the condition of AOP occlusion in China and could be helpful for further global studies.

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