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IMAGING HIGHLIGHT

Persistent proatlantal artery, a case report

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INTRODUCTION

An anomalous origin of the vertebral artery originating from the carotid artery is called persistent proatlantal artery. Persistent proatlantal artery of right side has rarely been reported. We report here a middle age man who was admitted for transient ischemic attack. The digital subtraction angiography (DSA) revealed an abnormal origin of the right vertebral artery from the right internal carotid artery.

CASE REPORT

A 54-year-old man was admitted to the hospital complaining of "repeated numbness of the left limbs for 20 days". The patient had no dizziness, amaurosis or weakness of limbs. Transcranial Doppler ultrasound showed right vertebral artery occlusion and severe stenosis of right middle cerebral artery. The patient was previously healthy. However, he has been smoking about half a pack of cigarette a day for more than 30 years. He denied having past history of hypertension and diabetes, surgical operation or head trauma. Neurological examination was normal.

The biochemical tests showed homocysteine 9.7 μmol/L, low-density cholesterol 1.84 mmol/L, high-density cholesterol 0.90 mmol/L, triglyceride 1.64 mmol/L, glycosylated hemoglobin 5.90%. DSA showed severe stenosis of the right middle cerebral artery, and the right vertebral artery originating from the right internal carotid artery. (Figure 1) The patient was treated with right middle cerebral artery stent implantation, double anti-platelet, and lipid-lowering medications. The symptoms subsided and he was discharged from the ward without any complications.

DISCUSSION

Proatlantal artery is one of the persistent carotid-vertebrobasilar anastomoses, and can be subdivided into two types depending on its origin. Type I, also known as the proatlantal intersegmental artery arises from the internal carotid artery and corresponds to the first segmental artery. Type II corresponds to the second segmental artery arises from the external carotid artery. Persistent proatlantal artery can also rarely arises from the common carotid artery. Irrespective of their origin, the artery passes through the foramen magnum and joins the other vertebral artery. A large angiographic study of 4,400 patients showed the frequency of primitive carotid–basilar and carotid–vertebral anastomoses in 0.14% and 0.023%, respectively.[1]

Most people with persistent proatlantal arteries do not have any clinical symptoms, and may be discovered by chance during physical examination. However, when surgery or other invasive endovascular procedures are proposed, the operator would need to be aware of this vascular anomaly. This vascular anomaly may also be encountered during cervical lymph node dissection, and surgery for the foramen magnum, cervical spinal cord and medulla.[2]

Another clinical significance of persistent proatlantal artery is that embolus from the anterior circulation can cause infarction of posterior structures such as brainstem and cerebellum via the anomalous arteries. Bahşi *et al*.[3] reported a patient with top of the basilar syndrome, where DSA showed a proatlantal artery I on the left side, with atheromatous plaques seen on the internal and common carotid arteries on the same side.

For enadarterectomy in the presence of proatlantal artery, Grego *et al*.[4] successfully performed carotid endarterectomy in a patient with stenosis of left internal carotid artery and a persistent proatlantal artery. Two balloon shunts were used in this surgery to change the blood flow of both internal carotid artery and proatlantal artery. Filter safety device play an important role in cervical carotid artery stent placement.[5] Morales *et al*.[6] believes that it is necessary to use two filter protection devices to protect the anterior and posterior circulation respectively in

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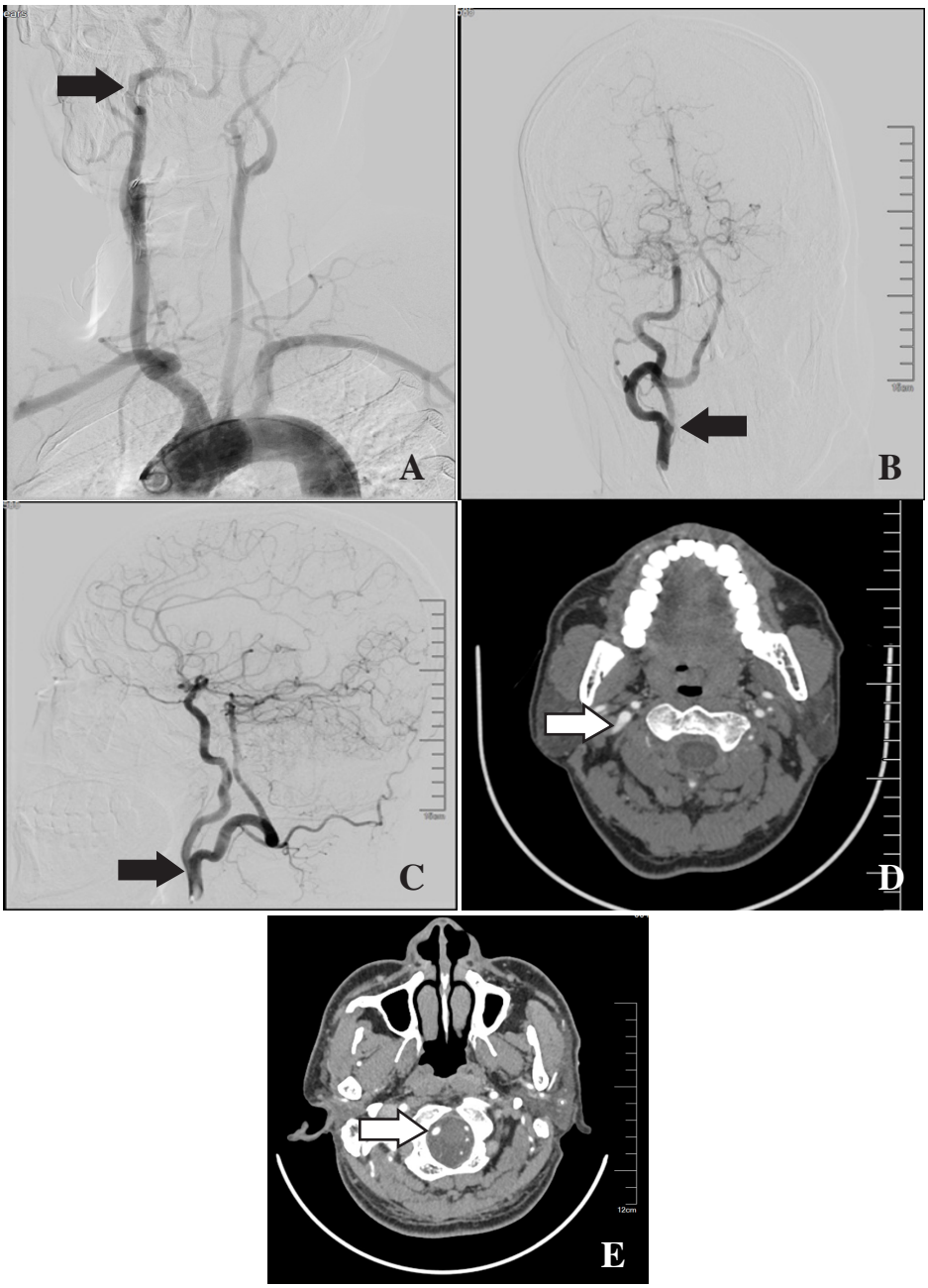

Figure 1. **A**. DSA of the aortic arch, no vertebral artery arise from the supraclavicular artery. **B**. DSA showed severe stenosis of the right middle cerebral artery, and persistent proatlantal artery of right side. **C**: Persistent proatlantal artery of right side (lateral position). **D**. CTA showed origin of the right persistent proatlantal artery. **E**. CTA showed right persistent proatlantal artery pass through the foramina magnum. The arrow shows the Persistent proatlantal artery of right side.

the endovascular treatment of carotid stenosis in proatlantal artery patients.

According to statistics, 10% of proatlantal artery patients have intracranial aneurysms.[7] Tian *et al*.[8] reported a patient with left Type I proatlantal artery and a ruptured aneurysm of left posterior inferior cerebellar artery. Buljan *et al*.[9] successfully performed carotid endarterectomy for a persistent proatlantal artery with a fusiform subclavian aneurysm. Unfortunately, this patient died of pneumonia due to complications of cerebral infarction.

Generally, the variation of the origin of one side of vertebral artery will not cause significant posterior circulation insufficiency, but when the opposite vertebral artery also have stenosis or ischemia from vasospasm, compensation of blood flow may be inadequate, and posterior circulation ischemia may occur.

In our patient, the anomalous vertebral artery siphoned its blood supply from the right anterior circulation, and the stenosis of the right middle cerebral artery resulted in frequent transient ischemic attacks. Timely stent implantation prevented the occurrence of cerebral infarction.

In our patient, the transcranial Doppler ultrasound made an erroneous diagnosis of right vertebral artery occlusion. The correct diagnosis of persistent proatlantal artery require the use of DSA.

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