Persistent carotid-basilar anastomoses are unusual embryological vascular remnants (1). The most common embryonic communication between the carotid and vertebrobasilar systems is a persistent trigeminal artery (PTA). This has been observed in 0.1 - 0.2% of cerebral angiograms, usually as an incidental finding (2). Although the presence of PTA is generally thought to be of uncertain significant, these arteries and their variants have been identified as a rare cause of cranial nerve dysfunction (3, 4). In many previous reports, there was an association with cerebral aneurysm in 14-22% of patients with PTA (5-9). Aneurysms of a persistent trigeminal artery itself are exceedingly rare and endovascular treatment of these aneurysms has not been attempted so much. We report a case of endovascular treatment for a persistent trigeminal artery aneurysm causing isolated sixth nerve palsy.

**Key Words:** Persistent trigeminal artery; Aneurysm; Endovascular treatment

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**Endovascular Treatment for a Persistent Trigeminal Artery Aneurysm Presenting as Isolated Sixth Nerve Palsy**

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The trigeminal artery is the most common persistent carotid-basilar anastomotic channel observed in adult life, and its occurrence probably represents a defect in cerebrovascular development. It can be associated with other congenital abnormalities such as cerebral aneurysms, but only rarely do aneurysms of the persistent trigeminal artery itself arise. Endovascular treatment of these aneurysms has not been attempted so much. We report a case of endovascular treatment for a persistent trigeminal artery aneurysm causing isolated sixth nerve palsy.

**CASE REPORT**

A 49-year-old female presented with diplopia which was worsen on looking towards the left side for 3 months. On examination, she had isolated sixth nerve palsy on the left eye (Fig. 1). The other cranial nerves were intact. There was no focal abnormality in the peripheral neurological system. She initially had brain magnetic resonance imaging and magnetic resonance angiography (MRA), which showed the unruptured aneurysm in the cavernous segment of the left internal carotid artery (ICA) (Fig. 2). She underwent four-vessel cerebral digital subtraction angiography, which revealed the saccular aneurysm at the bifurcation of the cavernous segment of the ICA and PTA (Fig. 3A & B). We planned endovascular treatment of the aneurysm. Under the general anesthesia, she underwent endovascular treatment of the PTA aneurysm using Guglielmi detachable coils via the left ICA. The coils were placed inside the aneurysm which was successfully occluded with preserving PTA (Fig. 3C & D). The patient tolerated the procedure well. Immediately after
procedure, she was well recovered without other complications and had only isolated sixth nerve palsy showed preoperatively. After one month of procedure, she was subjectively improvement of her diplopia and showed a little limitation of lateral gaze on the left side in the neurological examination.

DISCUSSION

Four types of primitive carotid-basilar anastomoses (trigeminal, otic, hypoglossal, and proatlantic intersegmental arteries) can be observed on the 24th day of an embryo (5-8, 10). These anastomoses disappear gradually when the basilar artery and the posterior communicating artery (PcoA) begin to develop. The PcoA finally becomes the main supplying artery as carotid-basilar communicating artery on the 32nd day of embryo. Twenty-five percent of all PTAs are associated with cerebral vascular diseases including arteriovenous malformation, carotid-cavernous fistula, moyamoya disease, Sturge-Weber syndrome, and so on (5, 11-13).

Based on the review of 261 cases with PTA in the literature between 1950 and 2003, PTA associated with aneurysm was presented in 39 cases (14). Of these, aneurysm was located at the bifurcation of the cavernous segment of the ICA and PTA in 17 cases, at the trunk of the PTA in 10, and at the junction of the ICA with the basilar artery in 5. In the remaining 7 cases, the location of aneurysms was not described in detail. Most cases of PTA do not cause clinical symptoms. Clinical symptoms such as ocular motor nerve dysfunction can be developed by the mass effect from the aneurysm in the cavernous sinus. The PTA also can be associated with a higher incidence of vertebrobasilar insufficiency and brain stem infarction (7, 15).

The PTA can take a lateral or medial course. When it arises from the posterolateral aspect of the intracavernous portion of the ICA, it runs underneath the abducent nerve and continues caudally between the trigeminal and abducent nerves to join the distal basilar artery. When it arises from the posteromedial aspect, it runs caudally through the sella turcica and pierces the clival dura at the dorsum sellae to join the basilar artery. Cranial nerve displacement or distortion is less likely in this variation (2, 16). In our case, the source images of MRA showed the course of a PTA and confirmed that a saccular aneurysm of the left PTA was located at the lateral aspect of the cavernous segment of the left ICA, which was might be the cause of isolated sixth nerve palsy. It was very difficult surgically to

Fig. 1. The photography of eyeball movements. It reveals isolated sixth nerve palsy on the left eye. Left side gaze (A), Right side gaze (B).

Fig. 2. The source images of magnetic resonance angiography show that a saccular aneurysm of the left persistent trigeminal artery is located at the lateral aspect of the cavernous segment of the left internal carotid artery (A, B).
approach the cavernous segment of the ICA which located deeply in front of the brainstem and close to the cranial nerves and perforating vessels. Therefore, we performed endovascular treatment for the PTA aneurysm.

In conclusion, although the PTA aneurysm is incidental in most cases, it can occasionally cause cranial nerve dysfunction including, as in this case, isolated sixth nerve palsy. This is the second case report in literature describing endovascular coiling of such an aneurysm. In case of the therapeutic challenge to the PTA aneurysm, endovascular treatment should be considered as the first line management.

Fig. 3. The pre- (A, B) and postoperative (C, D) angiography of the left internal carotid artery. Anteroposterior view (A, C), Lateral view (B, D).

References

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