Case Report

Treatment of traumatic trigeminal-cavernous fistula by coil embolization and compression of carotid artery

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We report a case of a traumatic cavernous fistula supplied by a persistent primitive trigeminal artery. The process of treatment was unique in this case. Fistula was subcompletely occluded by coiling from primitive trigeminal artery. Residual fistula was helped to form thrombosis by compression of the carotid artery with hand in the procedure. Long-term follow-up was satisfactory. Traumatic cavernous fistula supplied by a persistent primitive trigeminal artery could be treated by embolization and temporal compression of the parent artery might be useful for residual minimal fistula.

Key words: Carotid cavernous sinus fistula, embolization, primitive trigeminal artery, therapeutic, trauma

Introduction

The trigeminal artery is a persistent, embryonic, vascular anastomotic connection between the cavernous internal carotid artery (ICA) and the basilar artery. Its rate of occurrence is between 0.1 - 0.8%.[1,2] Trigeminal cavernous fistula (TCF) is rarely reported in the literature.[3-7] We describe a case of a traumatic fistula from the persistent trigeminal artery (PTA) to the cavernous sinus treated by coiling and compression of the carotid artery in the procedure.

Case Report

A 25-year-old man presented with pulsatile exophthalmos and chemosis of the left eye and an audible bruit two days after a motor vehicle accident. He did not require further treatment until the vision became poorer one year after the accident. Cerebral digital subtraction angiography (DSA) was performed under local anesthesia. The diagnostic angiogram demonstrated a fistula supplied by an adult type persistent primitive trigeminal artery with a flow from the basilar artery [Figure 1A] and the fistula was also supplied by the left internal carotid artery (ICA) on the C5 segment [Figure 1B]. The venous drainage was mainly into the left cavernous sinus and then into the superior ophthalmic vein and contralateral cavernous sinus.

An 8F ENVOY guiding catheter (Cordis Co. USA) was introduced into the internal carotid artery and was flushed with heparin saline (300ml/h, 8u/ml). A #1 detachable latex balloon was mounted on a balloon-catheter (Balt Co. France). We tried to float the balloon into the fistula via the left ICA. But the efforts were unsuccessful. It was changed by Prowler-10 microcatheter guided by microwire Agility-10 (Cordis Co. USA). But the pathway to the fistula was too acute angled and small to guide the microcatheter into the fistula. Then Prowler-10 microcatheter was guided deeply into the cavernous sinus from the route from the basilar artery and primitive trigeminal artery. The coils were packed into the cavernous sinus until the sixth coil embolized the distal end of the primitive trigeminal artery. Vertebral angiogram showed the closure of the fistula and the primitive trigeminal artery [Figure 1C].

Another left carotid angiogram found that the flow into the fistula dramatically decreased [Figure 1D]. Because of the previous difficulty in the placement of the microcatheter into the fistula, we just compressed the left carotid artery on the neck in order to form the thrombus. The procedure was under local anesthesia and the patient was monitored neurologically during the manual carotid compression. Fortunately, the angiogram after compressing the carotid artery for 30min showed that the fistula was closed [Figure 1E]. All the symptoms and signs disappeared in two weeks. Angiogram follow-ups one week and one year after embolization proved a durable result.

Discussion

Since Enomoto et al. first reported TCF,[8] we found 16 cases of TCF reported in the literature [Table 1], whose treatment had evolved from internal carotid artery embolization without compression.
ligation to endovascular occlusion with a detachable balloon or coils.\textsuperscript{[1-13]} Rupture of PTA aneurysms can result in subarachnoid hemorrhage or carotid-cavernous fistulas.\textsuperscript{[2,12]} Some cases of TCF happened spontaneously without aneurysms.\textsuperscript{[3-6,10,11]} Other cases were induced by trauma just like ours.\textsuperscript{[1,2,7,9,13]}

The PTA, not an uncommon incidental finding, connecting to the ICA inside the cavernous sinus, may be the site of fistula as in this case.\textsuperscript{[10]} In some cases of TCF reported in the literature, the balloons or coils occluded the fistula just at the connection point of PTA on the wall of ICA.\textsuperscript{[3,4,10]}

The basilar artery and its branches of both posterior cerebral arteries and superior cerebellar arteries developed well in our case. Therefore we were sure that PTA can be occluded without any neurological

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Table 1: Cases of trigeminal cavernous fistula in the literature

<table>
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complication. Trigeminal cavernous fistulas cured without preservation of PTA have been reported previously.\(^5,6,7,12,13\)

Difficulty of insertion of balloon or microcatheter inside fistula in TCF cases has also been reported in the literature.\(^1,3,5,6,11\) Some special methods, such as stabilization with undetachable balloon,\(^5\) transvenous coiling,\(^6,11\) were utilized to overcome the difficulty. In our case, after we failed to place the balloon and guide the microcatheter into the orifice of the fistula via the ICA, we tried to guide the microcatheter from the basilar and trigeminal artery into the fistula and coiled cavernous sinus. This approach has been reported only by Tokunaga et al.\(^3\)

In this case, there was a little remnant of fistula on the ICA after the packing of the cavernous sinus and occlusion of the trigeminal artery. We pressed the carotid artery for 30 min and waited for formation of thrombus inside the fistula. We had a similar experience published before in the treatment of traumatic CCF cases.\(^14\) The coils inside the sinus could dramatically slow down fistula flow and coils were thought to be the core of thrombus formation. Oka et al. reported a case of TCF with a small residual fistula after transvenous embolization. The residual fistula was found occluded completely in the angiogram follow-up 14 days later.\(^6\)

**References**


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