Treatment of bilateral spontaneous dural carotid-cavernous fistulas by coils and sclerotherapy

Case report

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A case of bilateral spontaneous carotid-cavernous fistulas producing increased intraocular pressure is reported. The fistulas lay between the meningeal branches of the internal carotid artery (ICA) and the cavernous sinus, but the ICA itself was not involved. Successful treatment was accomplished by the introduction of steel coils and a sclerotic liquid into the cavernous sinus via the distal superior ophthalmic vein.

A CASE of bilateral spontaneous dural carotid-cavernous fistulas is presented. Because these lesions are rare, there are few reports on treatment methods used to close them. The fistulas in this case were communications between the meningeal branches of the internal carotid artery (ICA) and the cavernous sinus. Two obliterative techniques — the introduction of steel coils and sclerotherapy — were used via a venous approach to occlude the fistulas in this case.

Case Report

This 60-year-old woman was admitted to our institution for treatment of a bilateral "red-eyed shunt syndrome" (typical carotid-cavernous fistulas). The orbital symptoms included bilateral conjunctival injection, mild nonpulsating exophthalmos (3 mm by the Hertel exophthalmometer), chemosis, and increased intraocular pressure (28 mm Hg on the left and 25 mm Hg on the right). Visual acuity and visual fields were within normal limits. The symptoms had begun spontaneously 1 month earlier; there was no history of head injury. Funduscopic examination disclosed bilateral venous dilatation. Computerized tomography scans were normal. Despite medical treatment with acetazolamide, epinephrine, and timolol maleate, intraocular pressure remained raised. To prevent deterioration of vision, it was decided to attempt obliteration of the fistulas. Bilateral carotid angiography confirmed the diagnosis and revealed a low-flow dural arteriovenous malformation of the cavernous sinus supplied by hypertrophied dural branches of the ICA. The superior ophthalmic veins were noted to be abnormal in the early angiograms (Fig. 1). There were no feeding branches from the external carotid artery. It was decided to obliterate the fistulas via the superior ophthalmic vein.

With the patient under general anesthesia, the right angular vein was exposed. A No. 5 French catheter was introduced into the distal superior ophthalmic vein, after which two small Gianturco steel coils were released into the vein (Fig. 2). After treatment, a marked decrease in the right conjunctival congestion was noted and the right intraocular pressure was normal.

Control right carotid angiography 2 months postoperatively showed that the right meningo-hypophyseal trunk was still opacified but that the superior ophthalmic vein was not (Fig. 3 left). At a second operation performed at that time, the left angular vein was ex-
Bilateral spontaneous carotid-cavernous fistulas

Preoperative selective internal carotid angiograms. Left: View of the right side showing the carotid-cavernous fistula supplied by the meningeal trunks. In this early view the superior ophthalmic veins are also shown to be abnormal (arrows). Right: View of the left side showing the contralateral carotid-cavernous fistula.

Proposed and USCI open-ended guide wire* was introduced into the angular vein and passed into the cavernous sinus. One milliliter of the sclerosing agent tetradecyl sulfate was injected through the guide wire. A left carotid angiogram obtained after injection revealed that the fistula had disappeared (Fig. 3 right). The patient's intraocular pressure was normal without medical treatment.

Discussion

Spontaneous dural internal carotid-cavernous fistulas present difficult therapeutic problems. Conservative treatment is preferable in patients with mild local clinical symptoms because of the high probability of spontaneous occlusion or of occlusion after angiography, a phenomenon which probably relates to partial or complete thrombosis of the cavernous sinus.

An aggressive therapeutic approach is warranted in patients presenting with deteriorating vision. In our patient, the indication for surgery was the progressively increasing intraocular pressure. In their report on bilateral spontaneous carotid-cavernous fistulas, Vifieula, et al., proposed that only the most symptomatic side be subjected to carotid artery balloon embolization.

In our case, since it was not possible to occlude the two ICA's by means of detachable balloons, occlusion of the venous component seemed to be a reasonable alternative. Previous reports have described use of a retrograde route via the superior ophthalmic vein to reach carotid-cavernous fistulas. Peterson, et al., occluded a traumatic carotid-cavernous fistula via the supraorbital vein by electrothrombosis. Conley, et al., performed electrical thrombogenesis and packed the sinus with a mixture of bone wax and mineral oil. Mullan and Yoneda, et al., also proposed a venous approach for treatment of these lesions. Tress, et al., were able to ablate a spontaneous carotid-cavernous fistula via the superior ophthalmic vein by the introduction of Gianturco coils. Bitoh, et al., used cobalt irradiation to successfully treat two spontaneous carotid-cavernous fistulas.

If the treatment of choice for cavernous dural arteriovenous malformation is distal occlusion of the abnormal dural feeders, the venous approach seems to be a good alternative when the dural malformation involves the cavernous sinus and only the meningeal branches of the ICA.

* USCI guide wire manufactured by USCI Division, Billerica, Massachusetts.
Left: Right carotid angiogram obtained 2 months after the first operation. The right meningeal trunks are still opacified but the superior ophthalmic vein (arrow) is not. Right: Left carotid angiogram taken following injection of 1 ml of tetradecyl sulfate at the second operation. The carotid-cavernous dural malformation is completely obliterated.

References

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