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Giant Cavernous Aneurysm Associated with Trigeminal Artery: Treatment by Detachable Balloon

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Giant aneurysms of the cavernous internal carotid artery have been technically difficult to treat by direct surgical methods because of the surrounding cavernous sinus. Previous reports have recommended treatment of these symptomatic giant aneurysms by gradual cervical carotid artery occlusion utilizing a Selverstone or Kindt clamp [1–6].

With recent technical advances it is now possible to treat some intracranial aneurysms by detachable balloon embolization techniques [7–10]. We report the successful intravascular embolization of a giant cavernous carotid aneurysm, which was distal to a trigeminal artery.

Case Report

A 69-year-old woman presented with ophthalmoplegia due to paresis of the third and sixth cranial nerves, severe headaches, and decreasing visual acuity over a 3–4 month period. A cerebral angiogram demonstrated a giant aneurysm arising from the anterior portion of the cavernous carotid artery, projecting laterally. The aneurysm measured 25 mm × 24 mm × 20 mm. In addition, there was a persistent trigeminal artery arising from the posterior portion of the cavernous carotid artery that supplied the midbasilar artery (Fig. 1).

Surgical treatment was recommended because of increasing ophthalmoplegia and headaches. Direct surgical clipping of the aneurysm was not feasible owing to the location and size of the aneurysm. Occlusion of the cervical carotid artery would not be curative because of substantial collateral arterial supply to the proximal cavernous carotid artery by the trigeminal anastomosis. The patient was thus referred for balloon embolization therapy.

From a transfemoral approach, a Hieshima detachable silicone balloon (Interventional Therapeutics Corp., 664 S. San Marcos Rd., Santa Barbara, CA 93111) [11] was flow-directed up the petrous and cavernous internal carotid artery beyond the origin of the trigeminal artery. The balloon, which was filled with metrizamide at a concentration of 200 mg % iodine for opacification, was then inflated proximal to the aneurysm neck.

Test occlusion was performed for 20 min with the balloon fully inflated. No change in neurologic condition was noted. The balloon was then detached by gentle traction.

A postembolization angiogram showed obliteration of the aneurysm due to occlusion by the balloon. In addition, the trigeminal artery was widely patent with good flow to the posterior circulation. Flow to the left middle cerebral artery was also visualized via the posterior communicating artery (Fig. 2). The patient was observed overnight and discharged home the next day in stable condition. Postembolization skull X-rays at 24 hr, 1 month, and 3 months showed the balloon to be intact without change in size or position. Over the course of 3 to 4 weeks, the aneurysm thrombosed with alleviation of mass effect. The patient's ophthalmoplegia resolved completely and her pain and headaches diminished. Clinically, both at 3 months and at 1 year postembolization, the patient had no further symptoms referable to her aneurysm, and she has resumed normal activities.

Discussion

This case is unusual because persistence of the trigeminal artery was also associated with a giant cavernous aneurysm. Thus far, only a few case reports documenting cavernous aneurysms with a primitive trigeminal artery have appeared in the literature [12, 13]. The association of aneurysms with anomalous embryological development is difficult to assess given the relatively rare occurrence of both [13–16].

Wolpert [13] described three patients who had aneurysms associated with a persistent trigeminal artery and summarized 14 other cases. Of these, only two were associated with aneurysms of the carotid artery and one was on the contralateral side [13]. Hook [17] and Bingham and Hayes [18] thought that persistent embryological vessels were more predisposed to aneurysmal formation due to structural defects in their wall; however, this was not proven by pathologic studies. In this instance, the association of a giant cavernous aneurysm with a trigeminal artery was probably coincidental. It does, however, pose a problem in terms of surgical management. It also emphasizes the role that intravascular detachable balloon embolization therapy may have in the treatment of complex intracranial aneurysms.

Previous reports, including those by Debrun et al. [8, 10] and Berenstein et al. [7], have demonstrated the usefulness of detachable balloon embolization therapy for the treatment of large and giant aneurysms of the anterior circulation. This procedure is performed with local anesthesia from a femoral

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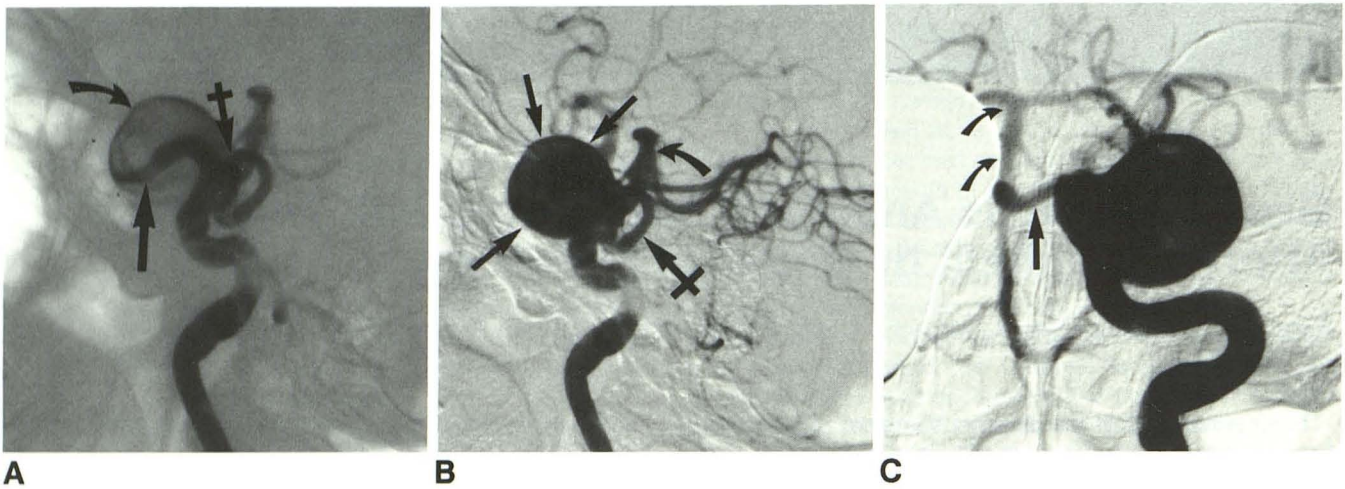

Fig. 1.—*A*, Subtraction angiogram, lateral view in early arterial phase, shows neck of aneurysm (*straight arrow*) and laminar flow within aneurysm (*curved arrow*). Trigeminal artery (*crossed arrow*) is also shown.

***B*, Internal carotid artery angiogram, subtraction view in lateral projection, shows giant cavernous aneurysm measuring 25 mm × 24 mm × 20 mm (*straight arrows*). The aneurysm arises from anterior portion of cavernous internal carotid artery. In addition, there is a persistent trigeminal artery arising from posterior portion of cavernous carotid artery (*crossed arrow*). This supplies basilar artery and posterior circulation (*curved arrow*).**

***C*, Frontal view angiogram shows giant aneurysm, trigeminal artery (*straight arrow*), and basilar artery (*curved arrow*).**

Fig. 2.—Postembolization angiogram, internal carotid injection in lateral view, shows balloon occlusion of giant cavernous aneurysm (*straight arrows*). There is preservation of trigeminal artery (*crossed straight arrow*). Flow to middle cerebral artery (*crossed curved arrow*) is seen via posterior communicating artery (*curved arrow*) from basilar artery.

cerebral approach with continuous neurologic monitoring. Discomfort to the patient is minimal. If patients are neurologically stable for 24 hr after the embolization procedure, they are discharged home and followed clinically at 1 week and at 1-, 3-, and 12-month intervals. Long-term follow-up is still required to assess this mode of therapy.

For now, it appears that intravascular balloon embolization may provide an alternative form of therapy in the management of some surgically difficult and complex aneurysm cases. As more experience is gained in this technique, the indications for treatment will likely expand.

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