CASE REPORT

Spontaneous Thrombosis and Complete Disappearance of Traumatic Carotid-cavernous Fistulas After Angiography

Chao-Bao Luo*, Michael Mu-Huo Teng, Feng-Chi Chang, Cheng-Yen Chang

Department of Radiology, Taipei Veterans General Hospital and National Yang-Ming University School of Medicine, Taipei, Taiwan, R.O.C.

Traumatic carotid-cavernous fistula (TCCF) is a direct shunting fistula due to a tear in the cavernous portion of the internal carotid artery (ICA). Spontaneous thrombosis of the high-flow shunts in TCCFs is extremely rare. Most cases are treated using endovascular embolization to relieve the clinical presentations. We report 2 unusual cases of TCCF with spontaneous closure of fistulas at intervals of 2 and 10 days, respectively, after diagnostic angiograms. The possible mechanisms of spontaneous healing of the fistulas in these patients with minor head injury and small fistulas were presumed to be a transient decrease in fistula blood flow because of irritation of and/or subtle injury to the ICA by contrast media and/or catheter during diagnostic angiogram, with thrombosis formation at the fistula. [*J Chin Med Assoc* 2005;68(10):487–490]

Key Words: carotid-cavernous fistula, spontaneous thrombosis, traumatic

Introduction

A traumatic carotid-cavernous fistula (TCCF) is a high-flow fistula caused by a tear in the cavernous portion of the internal carotid artery (ICA) after head injury. The common clinical manifestations are bruit, chemosis, proptosis, decreased visual acuity, and cranial nerve palsy.[1–3] TCCF may occasionally result in life-threatening epistaxis or intracranial hemorrhage.[4] Being a high-flow shunt, it rarely resolves spontaneously. In the past 10 years, we have successfully managed 156 cases of TCCF using endovascular embolization. In the same period, we have also had 2 unusual cases of TCCF with spontaneous thrombosis and complete disappearance of the fistula at intervals of 2 and 10 days, respectively, after diagnostic angiography.

Case Reports

Case 1

A 48-year-old woman presented with chemosis and bruit for 4 months. She had suffered a bruise on the right frontotemporal region from a motorcycle fall 5 months before. At that time, she was sent to a local hospital with the chief complaints of nausea and dizziness. Computed tomography was performed and revealed no definite intracranial hemorrhage or space-occupying lesion. Conservative treatment started with the diagnosis of cerebral concussion. She was discharged without any neurologic deficit on the next day. Four months before this admission, chemosis and bruit were found and had deteriorated in the week before this presentation. She visited a local ophthalmologist for help and was referred to our department under the

*Correspondence to: Dr. Chao-Bao Luo, Department of Radiology, Taipei Veterans General Hospital, 201, Section 2, Shih-Pai Road, Taipei 112, Taiwan, R.O.C.
E-mail: cbluo@vghtpe.gov.tw • Received: November 4, 2004 • Accepted: April 15, 2005

impression of TCCF for further management. Physical examination showed a reddened right eye with proptosis and swollen conjunctiva. The cranial nerves were intact. There was no limitation of eye movement. In the right eye, the visual acuity was 6/6 and the optic disc was moderately pale with intraocular pressure of 21 mmHg. A bruit was heard in both orbital and frontal regions. Left carotid angiogram disclosed a TCCF without feeding artery from the contralateral ICA and both external carotid arteries. The dilated right superior ophthalmic vein was the only draining vein (Figure 1A). On the following day, the patient felt partial regressive change in the chemosis, but endovascular embolization was still arranged 2 days after diagnostic angiography. Before initiation of endovascular embolization, preliminary carotid angiogram revealed total obliteration of the fistula with patency of the ICA (Figure 1B). On day 4 of the admission, complete regression of the chemosis was observed. The patient had no evidence of TCCF recurrence throughout 6 months of clinical follow-up.

Case 2

A 72-year-old woman complained of chemosis and bruit after a fall from bed 1 week before admission. She denied losing consciousness and had no headache. Because she had had a ruptured aneurysm with subarachnoid hemorrhage at the junction of the ICA and posterior communicating artery and had undergone endovascular embolization in our department 1 year before, her family brought her back for management for fear that the symptoms might relate to the previously treated aneurysm. On admission, the patient was alert, could move all her extremities well, and had a normal cranial nerve examination. Bruit synchronous with her heartbeat was audible over her frontotemporal region. The intraocular pressure was 13 mmHg. Right carotid angiogram revealed a TCCF with posterior drainage to the inferior petrous sinus (IPS) and contralateral drainage to the right cavernous sinus and IPS (Figures 2A and B). There was no filling of the ophthalmic vein, which was incompatible with her initial complaint of chemosis (Figure 2B). In addition, coil compaction resulting in neck recurrence of the aneurysm was found. Because of the tortuous ICA in this aged woman, an electrodetachable coil was selected to occlude the fistula, but the free coil was not available at the time. The patient was discharged until the coils were available. Ten days later, she was readmitted for embolization. Physical examination showed complete resolution of the chemosis

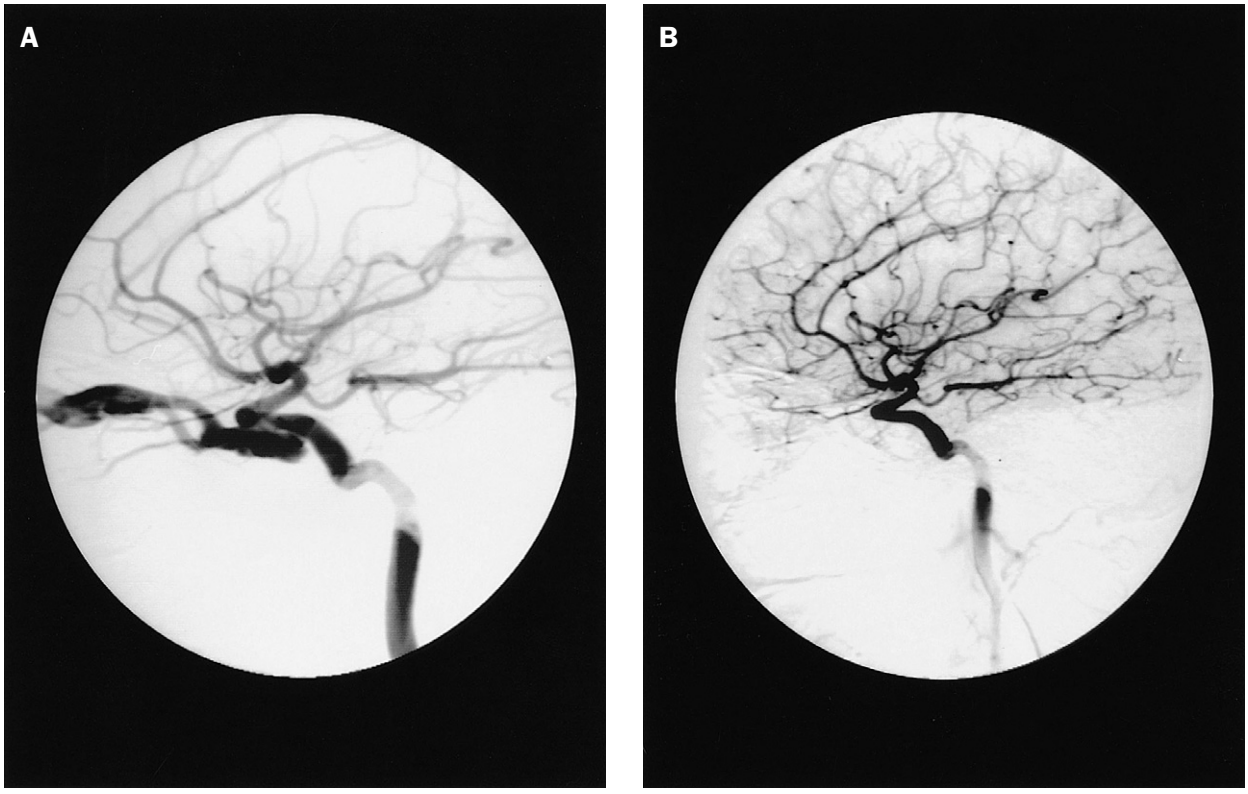

Figure 1. (A) Left carotid angiogram reveals a traumatic carotid-cavernous fistula (TCCF) with single drainage to the superior ophthalmic vein. (B) Two days later, before initiation of embolization, preliminary carotid angiogram revealed complete thrombosis of the TCCF with preservation of internal carotid artery blood flow.

and bruit. Carotid angiogram disclosed complete obliteration of the fistula with preservation of the ICA flow (Figure 2C). There was no evidence of recurrent fistula over the 3-month clinical follow-up period.

Discussion

Barrow et al[5] classified carotid-cavernous fistulas (CCFs) as either direct fistulas between the ICA and the cavernous sinus (type A) or dural fistulas at the cavernous sinus supplied by dural branches of either the ICA and/or the external carotid artery (types B–D). Direct CCFs generally result from trauma, are usually high-flow shunts, and tend to occur more frequently in motorcycle accident victims with severe head injury in Taiwan. Transarterial balloon embolization is an optimal treatment modality targeted to occlude the fistula with preservation of the parent artery. Recently, refinements in detachable balloon techniques have improved rates of ICA patency to 75%.[6] Conversely, dural fistulas arise spontaneously, are typically low-flow fistulas that tend to occur more frequently in middle-aged women, and have a more insidious progression to chemosis and proptosis. A less invasive modality such as radiosurgery is effective and safe to treat these low-flow fistulas.[7]

The mechanism of spontaneous closure of the TCCF remains unknown. Carotid angiography might play an important role in a few reported cases because the symptoms were alleviated immediately after carotid angiograms.[8,9] It is thought that thrombus is induced by vascular contraction caused by the contrast medium. A decrease in blood flow passing through the fistula secondary to a decrease in blood pressure during general anesthesia and a dissecting aneurysm with decreased blood flow in the cavernous portion of the ICA have also been reported.[8–10] In a review of 6 cases of spontaneous thrombosis of TCCFs, Nishijima et al[8] found that the venous drainage was single either anterior to the ophthalmic vein or posterior to the IPS, as occurred in our Case 1.

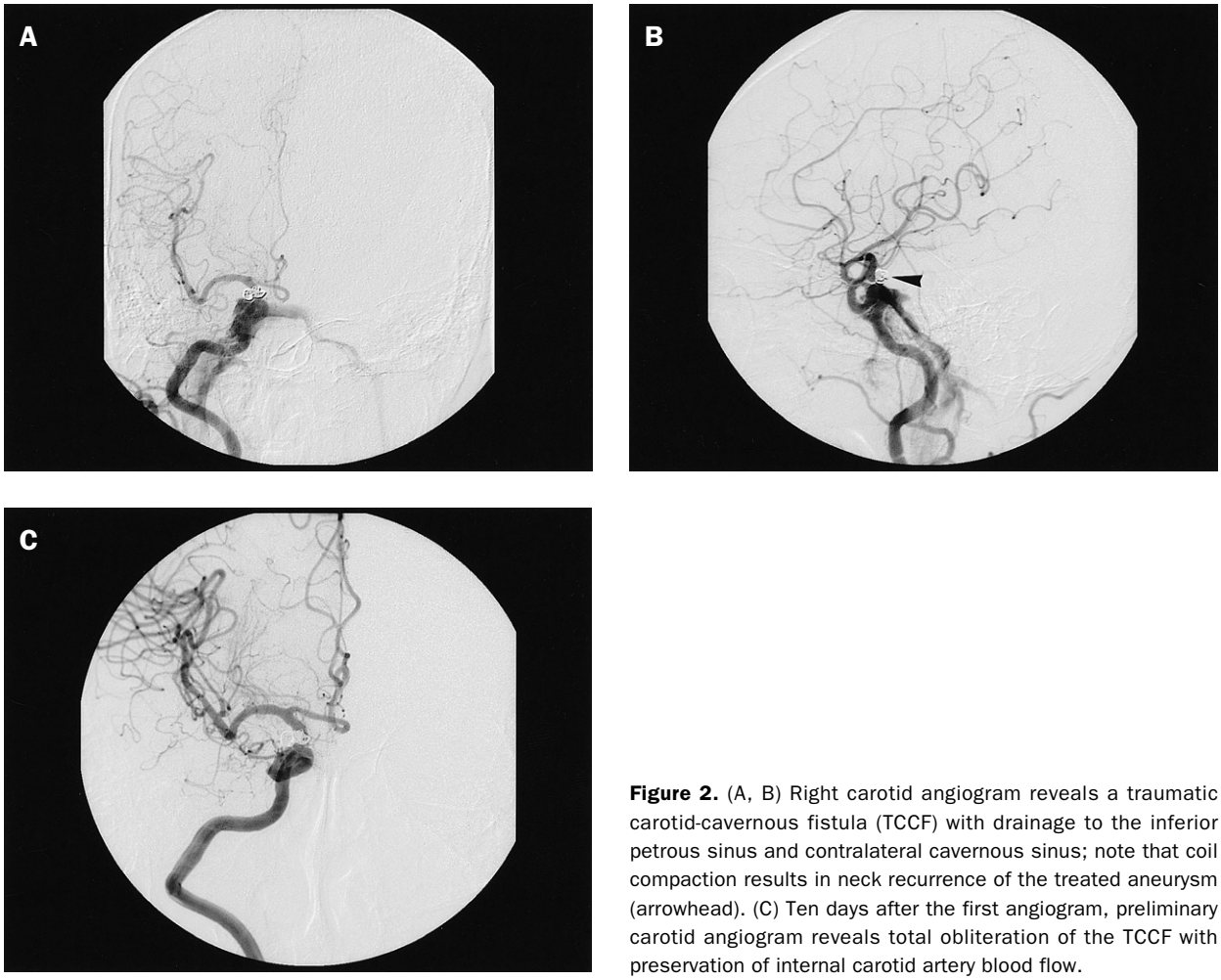

Figure 2. (A, B) Right carotid angiogram reveals a traumatic carotid-cavernous fistula (TCCF) with drainage to the inferior petrous sinus and contralateral cavernous sinus; note that coil compaction results in neck recurrence of the treated aneurysm (arrowhead). (C) Ten days after the first angiogram, preliminary carotid angiogram reveals total obliteration of the TCCF with preservation of internal carotid artery blood flow.

In our cases, we did not find the exact mechanism causing spontaneous thrombosis of the TCCFs. In Case 1, the chemosis and bruit lasted for 4 months. The angiographic procedure was the only factor that may relate to the spontaneous thrombosis of the fistula. The procedure itself, including catheter or contrast media, may irritate or subtly injure the carotid artery to induce thrombosis or arterial spasm. Therefore, diagnostic angiogram was considered an important predisposing factor in total obliteration of the fistula. In Case 2, the clinical manifestation of chemosis was not compatible with the initial diagnostic angiogram because of non-opacification of the ophthalmic vein since spontaneous thrombosis of the ophthalmic vein occurred before angiography. The subsequent angiographic procedure may or may not have accelerated thrombosis of the fistula.

These 2 cases raise the question of the necessity of using invasive techniques such as endovascular embolization to treat TCCFs resulting from minor head injury with formation of small fistulas. Spontaneous regression of CCFs has been reported in 6% of patients,[11] but most of these lesions were indirect CCFs. Spontaneous thrombosis of high-flow TCCFs is extremely rare. The risk in most untreated TCCFs is vision loss, which occurs in 54% of cases, of which 23% are blind and the other 31% have reversible vision loss that returns to normal after treatment.[12] Life-threatening intracranial hemorrhage or epistaxis occurs in 9.3% of patients,[4] therefore, aggressive management of TCCF is mandatory. However, when the symptoms are mild and there is no immediate risk to vision, or when the patient refuses or is reluctant to take the risks of embolization, manual carotid self-compression is an alternative that is sometimes successful in promoting thrombosis in cases with a relatively low flow shunt.[13] Compression induces simultaneous arterial hypotension and venous hypertension, which results in a transient decrease in the pressure gradient across the shunt to promote thrombosis. This modality of treatment is contraindicated in patients with significant carotid stenosis or ulcerative plaques, in whom conservative follow-up should concentrate on intraocular pressure, visual acuity, and cranial neuropathies.

Our observations demonstrate that spontaneous thrombosis of TCCFs is rare. It may occur in patients with minor head injury associated with small fistula and single venous drainage, especially in patients with incompatible clinical manifestation and angiographic finding. The procedure of diagnostic angiography, including the manipulation of the catheter and the use of contrast media, may play an important role in inducing thrombosis.

Acknowledgments

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