



Traumatic CCFS: Can We Wait..?

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Abstract

Carotid-cavernous fistula (CCF) is an abnormal communication between the cavernous part of internal carotid artery (ICA) or one of its branches or external carotid artery and the cavernous sinus. It is classified etiologically into posttraumatic or spontaneous CCF. Traumatic carotid-cavernous fistula (TCCF) is a direct communication between cavernous portion of the internal carotid artery (ICA) and cavernous sinus due to tear in ICA; it accounts for 75% of all the cases of CCFs. Apart from ophthalmoplegia and vision impairment, these high-flow TCCFs may result occasionally in life threatening intracranial hemorrhage or epistaxis. Most of the cases need endovascular embolization; spontaneous resolution of high-flow, direct TCCFs is extremely rare (less than 6% and usually with indirect CCF). We report two cases of high flow, direct TCCF (Barrow type A) that resolved spontaneously and confirmed by digital subtraction angiography.

Keywords: Traumatic CCFs, Spontaneous closure

Abbreviation : CCF Carotid cavernous fistula; ICA Internal Carotid Artery; TCCF Traumatic carotid cavernous fistula; MCA Middle Cerebral Artery; ACA Anterior Cerebral Artery; DSA Digital Subtraction Angiography.

Clinical History

Case – 1

29 year male noticed throbbing retro-orbital pain, diminution of vision and complete dropping of right eyelid following trauma to the right eye. Right eye examination showed ptosis, proptosis and complete external ophthalmoplegia with redness of eyes, with impairment of sensation over right V1, V2 distribution. Vision was 6/36 in the right eye and pupil was dilated not reacting to light. Fundus examination showed disc edema. Left eye examination and rest cranial nerve examination was normal.

MRI brain with orbit revealed bilateral cavernous sinus and superior ophthalmic vein dilatation (Right>>Left). Right ICA angiogram showed high flow arteriovenous fistula from cavernous segment of internal carotid artery and right cavernous sinus. It was draining anteriorly in superior ophthalmic vein , posteriorly into ipsilateral superior and inferior petrosal sinus. Left ICA angiogram showed retrograde filling of fistula through anterior communicating artery.

Patient was planned for embolisation of right cavernous sinus as per protocol. However due to financial constraints the procedure was delayed by 2 months. During hospitalization patient improved clinically. His proptosis, ptosis and vision improved completely and pupils became reactive to light; however external ophthalmoplegia did not recover completely.

Check DSA done before embolisation procedure showed Right ICA continuing in MCA and ACA. Fistula had closed spontaneously.

Case - 2

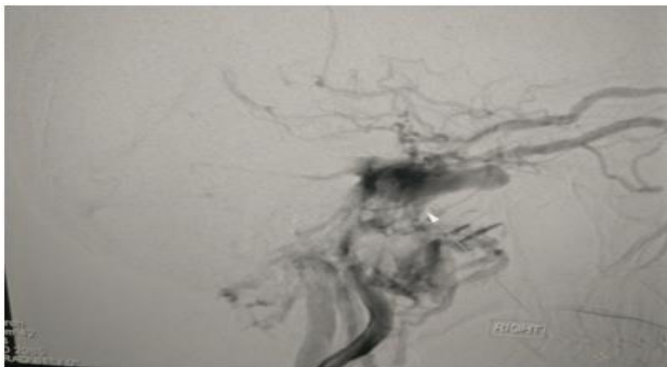
A 32 year female presented with throbbing right retro orbital pain with proptosis and diminution of vision following history of trauma from last 2 months.

Right eye examination showed proptosis and chemosis. Vision was 6/18 in the right eye and fundus showed disc edema. Pupils were normal sized reacting to light. Extraocular movements were normal. Left eye and other cranial nerve examination was normal.

MRI Brain with angiography showed a prominent right superior ophthalmic vein with exophthalmos suggestive of right CCF.

Right ICA angiogram showed high flow arteriovenous fistula from cavernous segment of internal carotid artery and right cavernous sinus. It was draining anteriorly in superior ophthalmic vein , posteriorly into ipsilateral superior and inferior petrosal sinus.

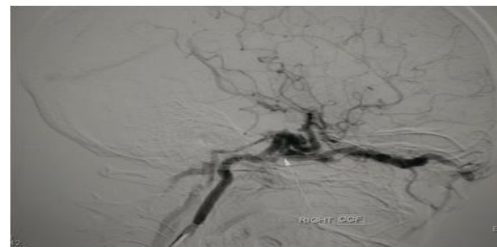
Due to financial constraints, patient was not able to arrange funds for embolisation. Hence procedure was delayed by 2 months. During follow up, patient's proptosis and chemosis resolved. Vision also improved. Repeat DSA showed Right ICA continuing in MCA and ACA. Fistula had now closed spontaneously with formation of pseudoaneurysm.



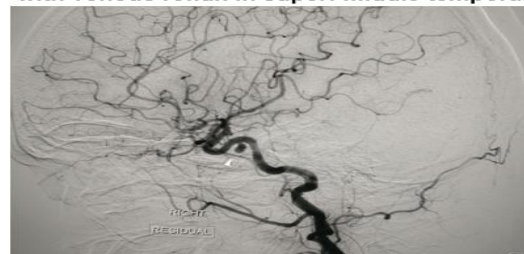
1) Right angiogram showing Direct CCF with extensive venous reflux



2) Spontaneous closure of CCF with residual aneurysm in distal cavernous ICA



1) Right angiogram showing Direct CCF with venous reflux in superf middle temporal vein and SOV



2) Spontaneous closure of CCF with small residual aneurysm in distal cavernous ICA

Discussion

Traumatic CCFs account for up to 75% of all CCFs¹ and they are the most common type of CCFs. They are usually seen in young patients, typically occurring as a result of closed head injury. There are various theories regarding the mechanism of CCF formation after head trauma. One theory¹ holds that the carotid artery is directly torn either by shear forces during the traumatic incident or by a bony fracture. An alternative second theory² is that there is a sudden increase in intraluminal pressure of the ICA with concurrent distal artery compression, which forces rupture of the vessel wall and results in a CCF.

Barrow et al³ classified CCFs based on the flow and the connections between the ICA, ECA and the cavernous sinus into types A (Direct, high flow) and types B,C,D (Indirect).

The treatment of a carotid cavernous fistula (CCF)⁴ depends on the severity of the clinical symptoms, its angiographic characteristics, and the risk it presents for intracranial hemorrhage. Spontaneous closure of TCCFs is rare (less than 6%⁵, that too with indirect CCFs). Conservative management, consisting of external manual compression of the ipsilateral cervical carotid artery several times a day for 4–6 weeks, may be effective in the treatment of indirect, low-flow CCFs⁶. However, this is ineffective in the treatment of direct, high-flow fistulas.

In most instances, endovascular treatment is preferred⁴. The first treatment option should be endovascular embolization with a combination of detachable balloons, coils, stents, or liquid embolic agents. The procedure can be done using either an arterial or venous approach. If the patient is not amenable to embolization or if the embolization fails, then surgery (surgical ligation of the internal carotid artery or packing of the cavernous sinus) should be offered. The mechanism of spontaneous closure of the direct CCF remains unknown. Carotid angiography

might play an important role in a few reported cases where the symptoms were alleviated immediately after carotid angiograms.⁷ It is thought that the procedure itself, including catheter or contrast media, may irritate or subtly injure the carotid artery to induce thrombosis or arterial spasm. Nishijima et al. reported spontaneous occlusion of TCCF after orbital venography⁸. Therefore, diagnostic angiogram was considered an important predisposing factor in total obliteration of the fistula.

However in both our cases, the recovery of our patients was not immediately after DSA. It was thought to be unlikely that the procedure of DSA itself would have contributed to the closure of the fistula.

Overall, spontaneous closure of high flow fistulas that have occurred due to trauma are rare. These cases raise a point as to whether a 'WAIT and WATCH' policy can be followed while dealing with such situations as the treatment of these conditions prove very expensive and are not easily available in developing countries.

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