

Endovascular treatment of traumatic Carotid Cavernous fistula

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Key words: Carotido-Cavernous fistulas (CCF), trauma, endovascular, ophthalmoplegia

Introduction: Direct carotid cavernous fistulas (dCCF) result from disruption of the cavernous internal carotid artery (ICA) causing direct shunting into the cavernous sinus^{1,2}. Trauma is the most common cause of dCCF, as in our patient. Less frequently, spontaneous dCCFs occur because of rupture of a cavernous carotid aneurysm or rupture of a weakened carotid wall in patients with connective tissue diseases. The clinical presentation is a triade of chemosis, proptosis, and exophthalmos. Other findings include headache, diplopia, ophthalmoplegia, and decreased visual acuity³. Endovascular management is the current treatment for CCFs, but recurrence may happen. Trans arterial or trans venous route are used for the endovascular treatment^{1,3}.

Case report: A 75-year-old male presented one month after a traumatic brain injury from a syncope due to high blood pressure, with right otorrhagia, right exophthalmos and proptosis, immediately after trauma. He was hospitalized in University Hospital of Trauma Tirana and was discharge one week later with diagnosis: SAH and Right frontal contusion and normal vision without proptosis.

In three weeks progressive bilateral exophthalmos, proptosis, eyelid swelling appeared more expressed on the right (fig 1 a).

The examination showed: bilateral ophthalmoplegias, amaurosis OD, right afferent pupillary reflex and right corneal reflex was absent, left hyporeactive corneal reflex, left pupilar reflex was present.

The auscultation with a plain stethoscope over the bilateral temporal fossa, make evidence of a systolic pulsatile noise.

On ophthalmologic evaluation bilateral papilledema with high intraocular pressure (16 mmHg on left eye, 18 on right eye) was noticed. Amaurosis OD and significant reduction of visual acuity OS (can detect only light).

A cerebral Digital Substraction Angiography (DSA) was performed.

Direct right CCF, Type A according to Barrow was confirmed (fig 2). Immediate endovascular treatment was performed with direct detachable balloon occlusion of the right CCF under general anesthesia

through arterial femoral access. Through balloon protection of cranial ICA, another proper size balloon was blown inside the fistula. At the end of the procedure control confirmed the complete closure of the fistula (fig 3).

His clinical condition immediately improved with significant reduction of exophthalmos and proptosis, And the bitemporal systolic noise with conic and plane stethoscope auscultation disappeared.

Three days after discharge, the condition worsened with progression of exophthalmos and proptosis bilaterally, the systolic noise and supraorbital pulsation on the both sides reappeared in auscultation.

Another DSA was performed which showed re-opening of the right dCCF, with direct communication between the cavernous portion of the ICA and the cavernous sinus. (fig.4). Balloon in the cavernous sinus placed in the previous procedure was noted, but it seemed to allow the passage of the contrast from the ICA to the sinus. In these conditions, embolization of the cavernous sinus with coiling under the protection ICA with a balloon was decided. After placing the coils in the cavernous sinus, closure of the fistula was confirmed (fig.5). After the procedure, he was without systolic noise and supraorbital pulsation on auscultation bilaterally. After 24 hours, exophthalmos and proptosis were reduced and after 14 days visual acuity, ophthalmoplegia on the left eye improved. (fig 1b)



Fig1a: Exophthalmos and proptosis on admission



Fig 1b: Exophthalmos and proptosis 14 days after the second endovascular treatment



Fig 2: Direct right Carotido-Cavernous fistula Type A according to Barrow Classification (Red arrow: contaminated right cavernous sinus Blue arrow:right ICA)

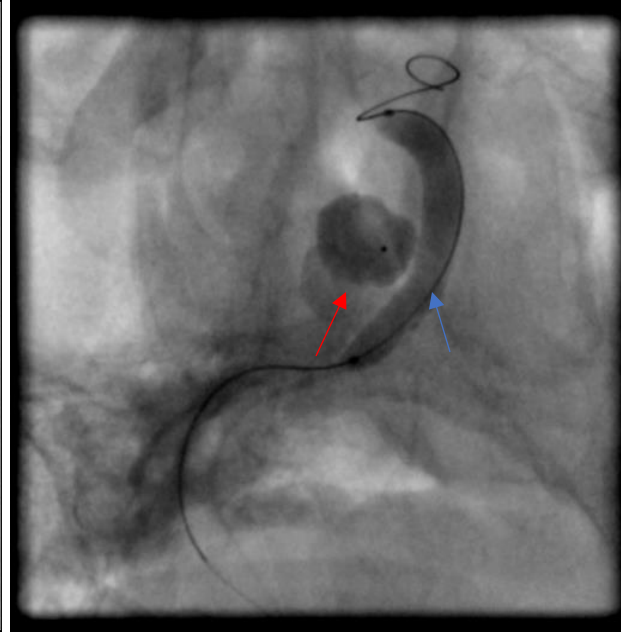


Fig 3: Procedure, red arrow: ballon in the right cavernous sinus

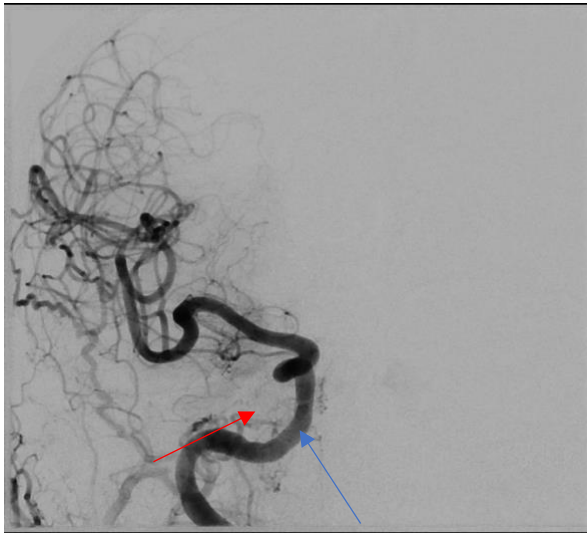


Fig 3 First DSA, Closure of the direct communication between right cavernous sinus and ICA Red arrow: right cavernous sinus without contamination Blue arrow:

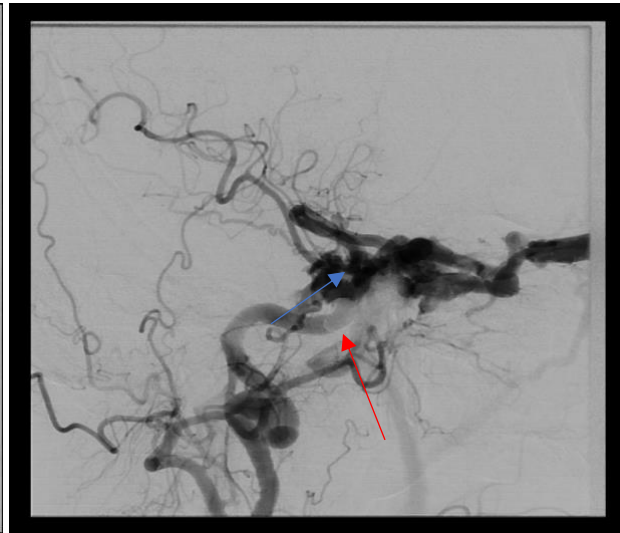


Fig 4; Second DSA the re-opening of the right dCCF, with direct communication between the cavernous portion of the ICA (red arrow) and the cavernous sinus (blue arrow)



Fig 5: Second DSA and treatment, Embolization of the cavernous sinus with coiling blue arrow, under the protected ICA with a balloon right arrow

Discussion: Traumatic dCCF is a direct connection between the intracavernous carotid artery and the surrounding cavernous sinus and it's a possibility consequence of any cranial trauma. Rupture of ICA aneurysms, arterial dissection, Ehlers-Danlos syndrome, fibromuscular dysplasia, pseudoxanthoma elasticum, or iatrogenic trauma from surgery⁴ are second causes. dCCF are usually unilateral but can occur bilaterally in 2% of patients, as in our patient. The majority of dCCFs are high-flow lesions, with acute onset of venous congestive symptoms, blindness, conjunctival hyperemia and edema, pulsatile exophthalmos, and progressive cranial nerve symptoms and without any likelihood of resolving spontaneously^{3,4}. The first endovascular experiences realized with detachable balloon with Serbinenko, exclusion of the ICA and the fistula. Our experiences with the same technique using Fogarty balloon with or without EC-IC by-pass resolved the fistulas with exclusion of the ICA.⁶

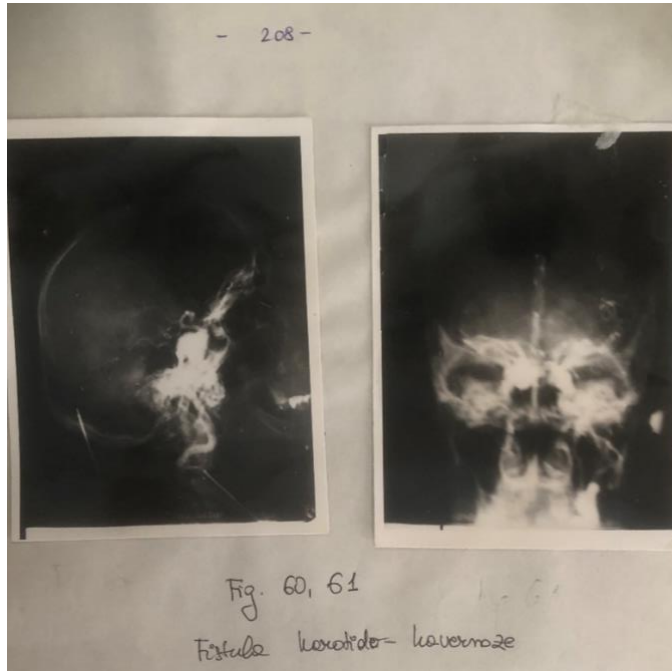
DSA is the gold standard in the diagnosis of CCF and must be performed before any potential intervention³. Cure rates after endovascular repair of CCFs is approximate 80%¹, recurrences are reported. Transvenous embolization (TVE) and/or transarterial embolization using detachable coils to preserve the ICA has become the mainstay of treatment for dCCF; and a combination of balloon, stent, and liquid embolization materials has also been reported^{4,5}.

Conclusion: dCCFs are a rare but treatable cause of cranial trauma. Endovascular embolization of CCFs with coiling or liquid agents is the only treatment.²

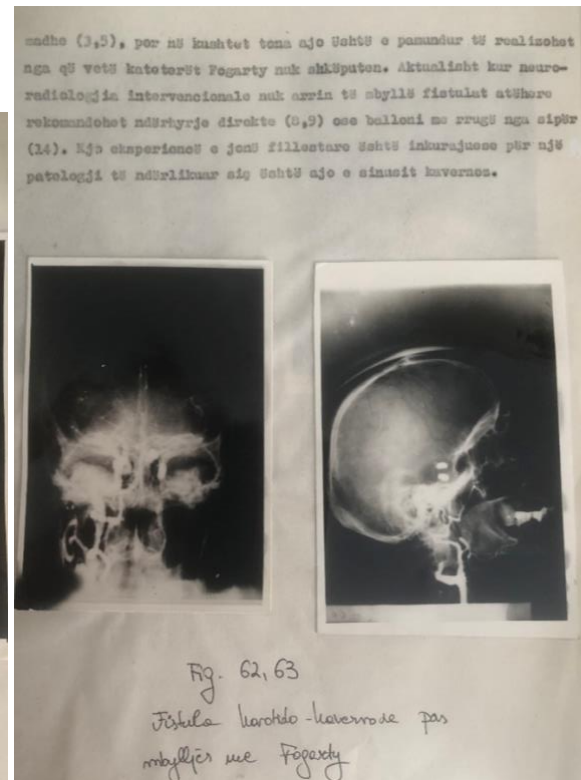
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Traumatic Carotido-Cavernous Fistula endovascular treatment with Fogarty balloon in 1982



Before treatment of Carotido-Cavernous Fistula



after treatment with Fogarty balloon exclusion

Personal gallery of Mentor Petrela 1982