Case Report

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Carotid Cavernous Fistula in a Serious Cranial Trauma: From Transcranial Doppler to Embolization: A Case Report

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Keywords

Carotid-cavernous fistula, Trauma, Transcranial Doppler, Arteriography, Embolization.

Introduction

Carotid-cavernous fistula (CCF) is a direct, high-flow fistula caused by a breach of the internal carotid artery into the cavernous sinus. It is a rare but not exceptional complication of serious craniofacial trauma. The diagnosis is suspected clinically, confirmed by computed tomography (CT) or magnetic resonance imaging (MRI) and arteriography. It is a therapeutic emergency requiring a rapid multidisciplinary approach, the therapeutic management of which has clearly progressed with the advent of interventional neuroradiology.

Observation

We report the case of a fasting 29-year-old patient, with no previous history, admitted to intensive care for treatment of serious multiple trauma with an initial Glasgow Coma (GCS) of 4, following a public road accident; a motorcyclist hit by a car with craniofacial impact point, the upper left and lower right limbs. In the injury assessment: mainly at the cerebral level we found a post-traumatic subarachnoid hemorrhage with fracture of the temporal bone, fracture of the clivus and the upper wall of the maxillary sinus, for which no surgical indication was made.

At the same time, clinically, the patient was sedated, we noted a pulsatile right exophthalmos, a right anisocoria, achemosis, redness with dilation of the conjunctival veins.An ophthalmological opinion was requested with afundus examination performed which showed papilledema. An orbital CT scan requested in addition, thus confirming the presence of GRADE 1 proptosis and dilation of the superior ophthalmic vein without damage to the muscular cone.

A transcranial Doppler carried out as part of neurological monitoring, showing a significant drop in the resistance indexes of the ipsilateral internal carotid artery, a reversal of blood flow

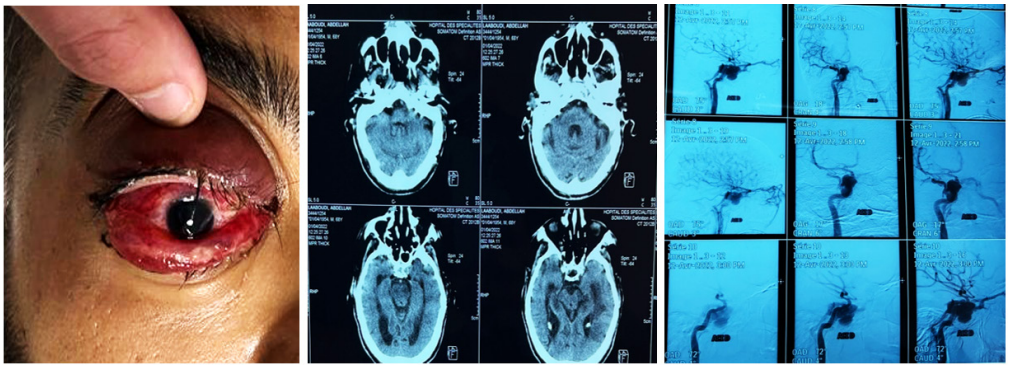

Image showing ophthalmological signs: Exophthalmos grade 1 with indirect signs of FCC: Arterialization of the cavernous sinus, it becomes opacified in the arterial phase chemosis, redness and exophthalmos dilated cavernous sinus enhanced in the arterial phase, Direct sign of carotid-cavernous fistula dilatation of the superior ophthalmic vein.

at the level of the superior ophthalmic vein associated with hyperflow. A carotid cavernous fistula was suspected. A cerebral CT angiogram was carried out, effectively revealing a left carotid cavernous fistula. Completed by diagnostic and therapeutic cerebral angiography. Embolization carried out by arteriography initially with persistence of posterior drainage, resumed by jugular and femoral venous route.

Discussion

Carotid-cavernous fistula is a rare but not exceptional pathology; the traumatic etiology is found in almost 75% of cases [1]. Anatomically, the intracavernous portion of the internal carotid artery is the only arterial system in the body that passes through a large venous plexus. Direct or indirect trauma to the craniofacial region can result in weakness of the muscular wall of the internal carotid artery or cause a true laceration producing a vascular shunt from a high-flow artery into a low-flow venous sinus, thus leading to fistula [2]. Clinically, symptoms can appear within hours of the trauma, or be delayed several months later. They are dominated by ophthalmological signs including ptosis, unilateral and pulsatile exophthalmos with a systolodiastolic murmur on auscultation of the periorbital and temporal region, which disappears upon manual compression of the ipsilateral carotid artery at the neck, diplopia, ophthalmoplegia, decreased visual acuity, ocular hypertonia. You may also have headaches and ringing in the ears. Neuroimaging constitutes the essential stage in the diagnosis and treatment of posttraumatic carotid-cavernous fistulas. Color Doppler ultrasound makes it possible to confirm the fistula by showing at the level of the ophthalmic veins an inverted Doppler signal directed towards the face with systolic enhancement. This also allows monitoring after embolization or therapeutic abstention. Transcranial Doppler directly visualizes the fistula with a sensitivity of 95% (but it is operator dependent).

CT scan quantifies exophthalmos by measuring the oculo-orbital index, looks for dilation of the superior ophthalmic vein and looks for bulging of the cavernous sinus, which constitute indirect signs of the fistula [3,4]. It also makes it possible to complete the post-traumatic injury assessment, particularly by looking for an associated fracture. Magnetic resonance imaging is of little interest since it provides the same information as CT [5]. The classification system universally adopted in the literature for carotid-cavernous fistulas is the scheme developed by Barrow and colleagues [6]: type A: direct communication between the internal carotid artery and the cavernous sinus. Type B: dural fistula between the meningeal branch of the internal carotid artery and the cavernous sinus. Type C: dural fistula between the meningeal branch of the external carotid artery and the cavernous sinus. Type D: type B + type C. Note that direct carotid-cavernous fistulas, classified as Barrow A type, are high-flow shunts, which occur three times more often than indirect types [7]. The advent of interventional neuroradiology has revolutionized the management of this type of fistula. Untreated, they endanger the vital (cerebral or subarachnoid hemorrhages, sudden epistaxis) and functional prognosis of the patient (ocular hypertonia, optic atrophy, reduction in visual acuity) [8,9]. The treatment consists of selective cerebral arterial embolization allowing closure of the fistula using a releasable internal balloon placed via the arterial route while preserving the internal carotid axis.

Conclusion

Post-traumatic FCC is a rare but serious complication that can have a functional or life-threatening prognosis. Their clinical diagnosis is based on ophthalmic and orbital signs, which should be actively sought in all head trauma patients. Daily monitoring by transcranial Doppler can allow their early detection and indicate additional explorations. Visualization of direct or indirect signs on the brain scanner should lead to diagnostic and therapeutic cerebral angiography. The place of interventional neuroradiology seems indisputable in first-line treatment.

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