

Case Report

Carotid cavernous fistula after percutaneous balloon compression for trigeminal neuralgia: Endovascular treatment with coils

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Abstract

Background: Percutaneous gangliolysis treatment of trigeminal neuralgia is rarely associated with vascular complications, such as hematoma, subarachnoid hemorrhage, and stroke. Internal carotid artery injury may also occur after misguided needle placement, particularly far posteriorly or medially, resulting in carotid cavernous fistula. Anatomical variations of the foramen ovale can predispose those complications.

Case Description: A young woman diagnosed with trigeminal neuralgia during 11 years was submitted to a balloon rhizotomy by percutaneous approach to the trigeminal ganglion, with severe intraoperative bleeding. Cavernous syndrome developed few hours later. Magnetic resonance imaging and digital subtraction angiography confirmed an indirect carotid cavernous sinus fistula, which was treated by one session of endovascular procedure using coils, achieving total occlusion of the fistula and total recovery of the symptoms.

Conclusions: Embolization with coils is a minimally invasive, safe, and effective procedure for the treatment of carotid cavernous fistulas, including those related to iatrogenic causes.

Key Words: Carotid-cavernous sinus fistula, embolization, endovascular procedures, rhizotomy, therapeutic, trigeminal neuralgia

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INTRODUCTION

Trigeminal neuralgia (TN) is a disturbing condition that affects 8 per 100,000 people annually,^[6] being characterized by episodic facial pain, usually unilateral and shock-like, located in the somatosensory distribution of the trigeminal nerve. Among the several surgical options proposed for drug-resistant TN are microvascular decompression (MVD), percutaneous balloon compression (PBC), radiofrequency thermocoagulation (RT), glycerol rhizolysis (GR), and gamma knife radiosurgery. Carotid-cavernous

fistula (CCF) as a complication of percutaneous procedures for TN have been hypothesized to be

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predisposed by a primitive foramen lacerum medius (a fusion of the foramen ovale with the foramen lacerum which can occur in up to 4% of the population), extension of the thermal lesion of radiofrequency to vascular components, posteriorly and medially misguided needles, and even the anatomical relation of the internal carotid artery (ICA) to the trigeminal nerve.^[4,8]

We report here a case of CCF following PBC treated successfully with transarterial coil embolization.

CASE REPORT

A 27-year-old woman with TN during 11 years in the left V2 and V3 divisions was submitted 6 years ago to microvascular decompression in the posterior fossa due to neurovascular conflict. Her symptoms disappeared for 4 years and she was resistant to standard drug therapy at the time. Percutaneous balloon rhizotomy was performed in another service. Massive bleeding during the procedure was described, and the patient presented with proptosis, eye pain, chemosis, and paralysis of extraocular movements in the left eye a few hours after the procedure, with worsening of symptoms over the following days. A brain magnetic resonance image (MRI) [Figure 1] showed an oval structure of $14 \times 13 \times 11$ mm adjacent to the left cavernous sinus. Moreover, a prominent and serpiginous tubular image in intraconal situation located caudal to the superior rectus muscle and cranially to retrobulbar segment of the optic nerve with significant hypointensity similar to that displayed in the cavernous portion of the ipsilateral ICA suggested a flow void compatible with vascular abnormality of high flow. This structure corresponded to the superior ophthalmic vein, which captured contrast and presented with ventral extraorbital insinuation and dorsal insinuation to the orbital apex through the superior orbital fissure with gradual reduction of its caliber. After 10 days, she was

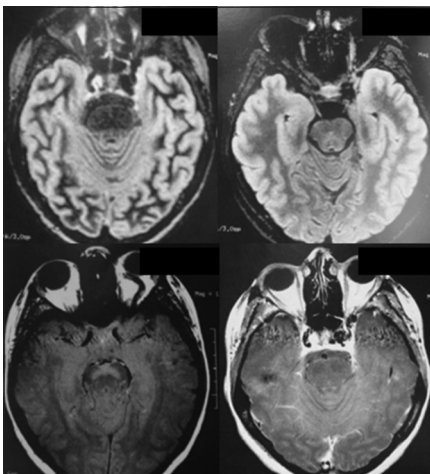


Figure 1: Axial views of brain MRI showing a vascular abnormality of high flow in the left cavernous sinus compatible with an arterIALIZED superior ophthalmic vein

referred to digital subtraction angiography (DSA) of the intracranial vessels, which confirmed the diagnosis of a high flow CCF. The fistula was indirect [Figure 2] because it filled the cavernous sinus retrogradely through an abnormal communication between the final segment of the posterior petrous portion of the ICA and veins draining to the sinus (vidian artery communicating with the inferolateral trunk). There was no other vascular abnormality involving the right ICA and external carotid artery bilaterally or posterior circulation [Figure 3]. Transarterial embolization of the fistulous orifice was performed using coils, with immediate cessation of early venous filling [Figure 4]. The patient showed complete regression of ocular symptoms in a period of 5 days. During a 6-month follow-up, the patient confirmed complete remission of the TN.

DISCUSSION

CCF as a complication of TN percutaneous treatments has been only barely reported.^[1,2,4,5,7,8] Most cases found in the literature occurred in elderly patients, as opposed to our patient.^[4,5,8] Clinical presentation often includes a pulsating noise (as described by the patients), the presence of a bruit over the affected eye that disappears with common carotid artery compression, headache, proptosis, chemosis, decreased eye movements, diplopia, and focal neurological deficits, such as paresis. Time between the percutaneous procedures and presentation of the CCF varied among case reports, however, in most

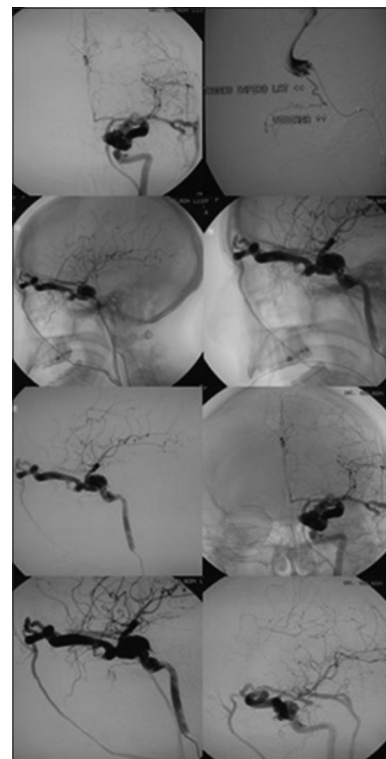


Figure 2: DSA showing the indirect carotid cavernous fistula

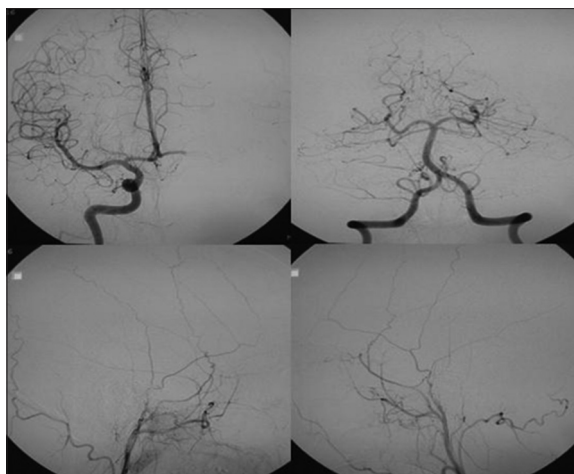


Figure 3: Normal DSA of the right ICA, posterior circulation, and both external carotid arteries

cases including our own, the initial symptoms appeared a few hours or days after percutaneous trigeminal ganglion approach. Langford *et al.* were the only ones to report a late presentation of CCF (8 months after PBC).^[5]

Except for Gokalp *et al.*,^[2] all the authors treated the fistulas through an endovascular approach. Most authors employed embolization with sclerosing agents.^[5,8] Just as Kuether *et al.* and Niu *et al.*,^[4,7] we decided for embolization with coils. Transarterial balloon occlusion has been the treatment of choice for direct CCF since the 1980s. However, the size of the cavernous sinus and of the fistula can compromise the success rate of this technique, and inadequate embolization can result from early balloon detachment, deflation, or rupture.^[3] Transarterial embolization with coils or other embolic materials are now considered the method of choice for the treatment of high-flow direct CCFs. Among the many options of embolic materials, platinum coils are the preferred method because of their reliability and controlled deployment, ease of access when compared with balloon embolization, and the wide range of sizes. The coils also can be easily readjusted or removed.^[3] Some authors state that full occlusion of the fistula is rarely achieved using coils alone and suggest using liquid embolic agents such as N-butyl-cyanoacrylate or onyx in combination with coils to achieve a denser packing of the fistula.^[9] In this case, we achieved full occlusion of the CCF using a single approach.

CONCLUSION

Although rare, incidental puncture of the internal carotid artery in its cavernous segment during percutaneous balloon compression for TN is an already well-described

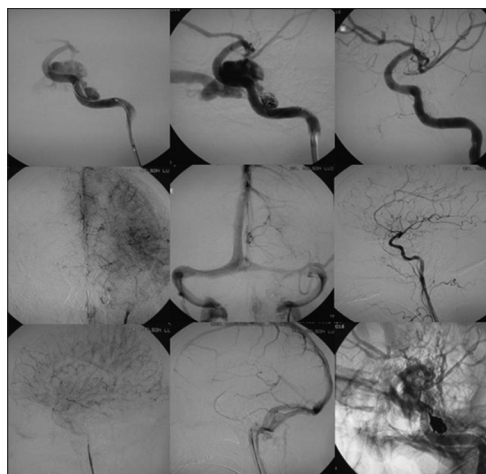


Figure 4: Endovascular microcatheterization of the left ICA showing the CCF and its treatment with coil embolization

complication. Treatment varies according to the angiographic flow pattern of CCF and the patient's symptoms, which can vary in intensity and time of evolution. With modern current endovascular devices, it is possible to carry out the treatment successfully avoiding open surgery.

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Conflicts of interest

There are no conflicts of interest.

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