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## Case Report

# Ischemic stroke and retinal artery occlusion after carotid aneurysm embolization <sup>☆</sup>

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## ABSTRACT

We present the case of a 72-year-old male with a right carotid aneurysm incidentally discovered after an ischemic stroke. After management of the stroke, stent-assisted coil embolization was performed to treat the aneurysm. Two simultaneous and early complications occurred: new ischemic strokes and branch retinal artery occlusions, respectively in the right occipital lobe and in the right eye. Treatment of unruptured carotid aneurysm using stent-assisted coil embolization can lead to severe complications involving both the brain and the retina. Multidisciplinary and close surveillance of patients should be performed to diagnose adverse effects of this endovascular treatment.

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## Introduction

Intracranial aneurysms, which prevalence is estimated between 2% and 4% [1,2], are localized deteriorations of the arterial wall resulting in dilatations of the cerebral arteries. Their etiopathogenesis is complex and involves a pro-inflammatory pathway, hemodynamic stress, and genetic factors, such as autosomal dominant polycystic kidney disease or collagenosis disorders (Marfan syndrome, Ehlers-Danlos syndrome type IV...) [3]. When unruptured, symptoms may be absent or minor and related to a local mass effect.

The most dreaded risk of intracranial aneurysms is rupture, leading to an 80% risk of morbidity and mortality [2].

Conventional treatment options for intracranial aneurysms are either surgical, consisting in clipping or bypassing the aneurysm, or endovascular where the aneurysm is coiled with the help of a balloon or a stent [2].

## Case report

We here report the case of a 72-year-old man with a medical history of high blood pressure and cardiac arrhythmia who presented an episode of ischemic strokes in both cerebral hemispheres (Fig. 1 a, blue arrows). Brain MRI also showed an unruptured aneurysm of the right carotid siphon, near the

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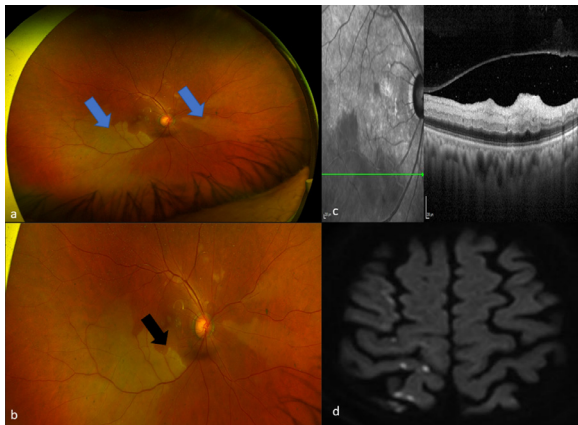
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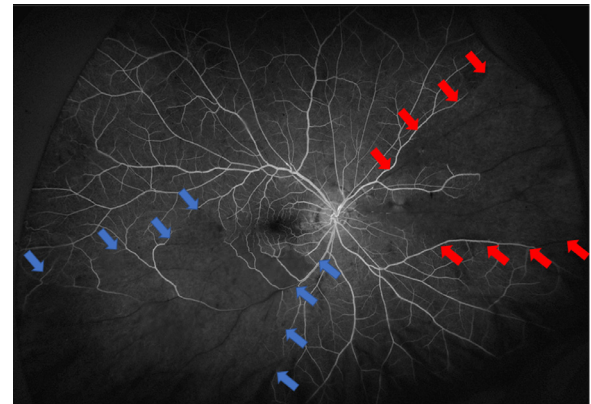
**Fig. 1 – (a) Brain MRI, FLAIR sequences. Multiples hypersignals dots are visible in both cerebral hemispheres, corresponding in strokes (blue arrows). (b) Angio-MRI of the supra-aortic trunks. Saccular aneurysm of the right carotid siphon (green star) is visualized, near the right ophthalmic artery (right arrow). (c) Cerebral angiography. Treatment of the aneurysm using stent-assisted coiling (red arrow).**



**Fig. 2 – (a) Ultra-widefield fundus picture of the right eye. Two retinal ischemic zones are visible: one in the inferotemporal area and one in the inferonasal area (blue arrows). (b) Close-up of the picture “a,” showing a possible cholesterol embolism in the inferotemporal retinal artery (black arrow). (c) OCT and infrared image of the inferior macular area showing early oedema of the inner retinal layers. (d) New brain MRI, FLAIR sequences. New ischemic strokes are visualized in the right occipital lobe, corresponding to the primary visual cortex.**

right ophthalmic artery (Fig. 1b). This aneurysm was asymptomatic. After appropriate stroke management, decision was made to treat the aneurysm using stent-assisted coil embolization (Fig. 1c, red arrows), 6 months after the initial stroke.

Two days after the procedure, the patient suddenly complained with a disturbance in his left visual field with no other neurological symptoms. An early examination in the eye emergency unit revealed in both eyes a best-corrected visual acuity of 20/20, a normal intraocular pressure, and normal anterior segments. His left fundus was unremarkable, while the right one showed retinal ischemic zones in the inferotemporal and nasal areas (Fig. 2a, blue arrows) caused by possible cholesterol embolism (Fig. 2b, black arrow). The OCT performed on the inferior macular area showed hyperreflec-



**Fig. 3 – Ultra-widefield fluorescein angiography was performed on the right eye, showing the two non-perfused retinal zones observed in Fig. 2a: inferotemporal zone (blue arrows) and nasal zone (red arrows). Laser photocoagulation was made on these zones, so as to avoid neovascular glaucoma and its complications. Angiography on the left eye was unremarkable.**

tivity of the inner retinal layers responsible for early edema (Fig. 2c). A new brain MRI was performed and revealed new ischemic zones in the right occipital lobe (Fig. 2d). After adapted management of the new stroke, ultra-widefield fluorescein angiography was performed (Fig. 3) revealing nonperfused retinal areas (blue and red arrows) corresponding in ischemic zones visualized in the right fundus picture (Fig. 2a). Decision was made to treat these zones by laser photocoagulation to avoid neovascular complications.

## Discussion

Endovascular treatment of intracranial aneurysms can lead to multiple complications, including delayed cerebral ischemia, aneurysm rupture, vasospasm, stent-related, and coil-related

complications. In this case, the patient possibly developed 2 of them: cerebral ischemia and coil-related complications.

On the one hand, cerebral ischemia in this case can be explained either by a vasospasm and/or a coil migration on the territory of the right posterior cerebral artery. The complaint of the patient in his left visual field, can easily be explained by the localization of the cerebral ischemia occurring in the right occipital lobe, where the primary visual cortex is located. Unfortunately, due to the emergency of the case, no visual field had been performed at the time.

On the other hand, coil-related complications can be explained by a coil migration in the right ophthalmic artery, -localized near the aneurysm-, resulting in multiple branch retinal artery occlusions. Because these ischemic areas spared the right fovea, the patient did not present any complaint in his right eye. Cases of retinal artery occlusion after aneurysm embolization are rare and poorly described in the literature [4–6].

To our knowledge, this is the first documented report where both the brain and the retina suffer from ischemic damages following a stent-assisted coil embolization.

In conclusion, patients treated with embolization of intracranial aneurysms located near the ophthalmic artery should benefit from a multidisciplinary and close surveillance including a systematic neurological and ophthalmological examination including fundus examination in both eyes. When the fundus reveals ischemic retinal zones, a new brain MRI should be quickly performed in order to evaluate brain ischemia.

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## Consent statement

Informed consent for publication of their case was obtained from the patient.

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