Case Report

Ischemic stroke and retinal artery occlusion after carotid aneurysm embolization

Benjamin Blautain, MD\textsuperscript{a,*}, Igor Leleu, MD\textsuperscript{b}, Elyse Jabbour, MD\textsuperscript{a}, Yannick Le Mer, MD\textsuperscript{a}

\textsuperscript{a} Hôpital Fondation Adolphe de Rothschild, 25, rue Manin, 75019 Paris, France
\textsuperscript{b} Centre Hospitalier des Quinze-Vingts, Service II, 28 rue de Charenton, 75012 Paris, France

\begin{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.

© 2021 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)
\end{abstract}

\section{Introduction}

Intracranial aneurysms, which prevalence is estimated between 2\% and 4\% \cite{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...) \cite{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 \cite{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 \cite{2}.

\section{Case report}

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

Consent statement

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

REFERENCES

[1] Keedy A. An overview of intracranial aneurysms. McGill J Med 2006;2:141–6.
[2] Zhao J, Lin H, Summers R, Yang M, Cousins BG, Tsui J. Current treatment strategies for intracranial aneurysms: an overview. Angiology 2018;1:17–30.
[3] Chalouhi N, Hoh Brian L, Hasan D. Review of cerebral aneurysm formation, growth, and rupture. Stroke 2013;12:3613–22.
[4] Hwan Shin S, Pyo Park S, Kim YK. Multiple small branch retinal arteriolar occlusions following coil embolization of an internal carotid artery aneurysm. Indian J Ophthalmol 2018;8:1208–10.
[5] Park H, Nakagawa I, Yokoyama S, Wada T, Motoyama Y, Kichikawa K, et al. Central retinal artery thromboembolism without ophthalmic artery occlusion during stent-assisted coil embolization of ophthalmic artery aneurysm. World Neurosurg 2019;121:77–82.
[6] Yoo M, Jin SC, Kim HY, Choi BS. Intra-arterial thrombolysis for central retinal artery occlusion after the coil embolization of paraclinoid aneurysm. J Cerebrovasc Endovasc Neurosurg 2016;4:369–72.