


CASE REPORT

Combined central retinal artery and vein occlusion shortly after mRNA-SARS-CoV-2 vaccination

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Learning points for clinicians

We describe a case of a combined central retinal artery occlusion and central retinal vein occlusion that occurred 2 days after the patient received the second dose of coronavirus disease 2019 vaccine. Clinicians should be alert that vision loss after vaccination may represent a possible ocular adverse event.

Case report

A 54-year-old female was referred to us 8 days after receiving the second dose of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccination (mRNA-1273) due to sudden severe vision loss in the right eye without eye redness or pain. The patient registered right eye onset symptoms 2 days after vaccination. She did not report reduced vision or other abnormalities in the left eye. She had a history of hypothyroidism. On the initial visit to our hospital, her right eye visual acuity was no light perception. Intraocular pressure was normal in both eyes. Slit-lamp examination revealed shallow anterior chamber, but no corneal or iris abnormalities were observed. Right eye fundus examination showed widespread flame-shaped hemorrhages in all four quadrants, whitening of the macula, papilledema and attenuated retinal arteries (Figure 1).

The image of optical coherence tomography (OCT) indicated hyper-reflectivity of inner retinal layers, severe thickening of inner retina and loss of the organized layered structure of the retina (Figure 1). OCT angiography images (Cirrus 5000 HD, Carl Zeiss, Germany) revealed an absence of vascular flow in foveal

and perifoveal areas. Based on the above findings, we diagnosed the patient with combined total central retinal artery occlusion (CRAO) and central retinal vein occlusion (CRVO).

Blood tests performed 2 days after vaccination were normal, except for reduced platelet count, $129 \times 10^9/l$ (reference range, $140\text{--}340 \times 10^9/l$). In our hospital, normal blood cell counts were registered, including platelets ($240 \times 10^9/l$), D-dimer ($0.7 \mu\text{g/ml}$) and fibrinogen. Erythrocyte sedimentation rate was 12 mm/h and C-reactive protein was 2.8 mg/l. Extensive workup, including anticardiolipin IgG/M, lupus anticoagulant, antimyeloperoxidase, antiproteinase 3, antithrombin III, protein C and protein S activity, treponema pallidum hemagglutination assay and serum HIV, was unremarkable. Systemic examination of the patient was unremarkable. She had normal blood pressure and heart rate. Electrocardiogram and echocardiography were unremarkable. Carotid duplex ultrasound and magnetic resonance angiography showed no carotid plaque or stenosis. Temporal artery ultrasound showed no sign of arteritis.

Fluorescein angiography (FA) 1 month after vaccination showed delayed perfusion filling with nonperfused areas in the macular and peripheral retina. Leaking vessels were found in the periphery of all quadrants (Figure 1).

Discussion

Combined CRAO and CRVO is an uncommon vaso-occlusive entity associated with multiple systemic conditions.¹ Combined cases generally present with severe visual loss and have rapid progression and poor visual prognosis. It is controversial which occlusion is the first event. However, in either case, causes of occlusion mostly include thromboembolic disorders with

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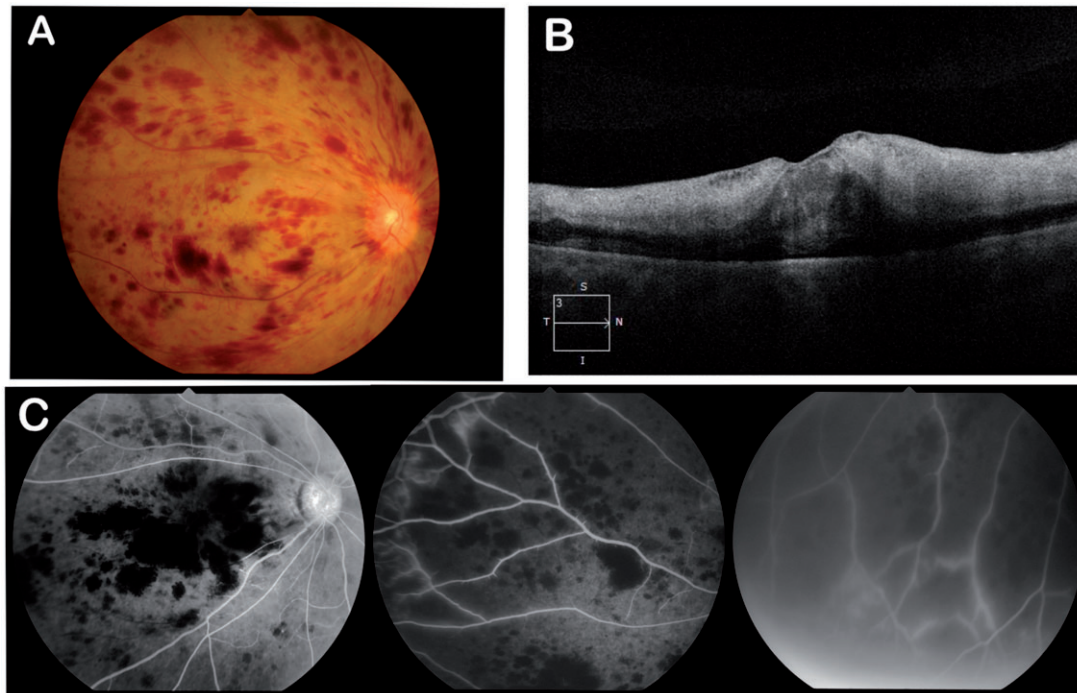


Figure 1. Right eye imaging after vaccination. (A) Fundus color photography 8 days after vaccination demonstrated the retina with congested appearance, widespread hemorrhages in four quadrants and papillary edema. (B) OCT 8 days after vaccination showed hyper-reflectivity and severe thickening of inner retinal layers and loss of the organized layered structure of the retina. (C) FA 1 month after vaccination (49 s) showed delayed perfusion and filling with nonperfused areas in the macula (left). FA (80 s) (middle). FA (154 s) of the peripheral retina denoted nonperfused areas and leaking and disrupted vessels (right).

rheological factors, vessel inflammation or mechanical compression.² Considering the short period between the appearance of symptoms and vaccination, combined CRAO and CRVO in this report provides a causal relationship with coronavirus disease 2019 (COVID-19) vaccination. It was suspected that thromboembolic events in the retinal vasculature might occur following COVID-19 vaccination.

To date, several cases of unusual thromboembolic events, including arterial or venous thrombosis, local microthrombosis, vaccine-induced immune thrombocytopenia and thrombosis (VITT) and related eye diseases after COVID-19 vaccination, have been reported.³⁻⁵ Patients with VITT have developed spontaneous thrombocytopenia mediated by platelet-activating antibodies against platelet factor 4.⁴ In this case, the platelet count was mildly decreased at onset. Leaking vessels were observed in FA imaging, indicating possible retinal vasculitis. The vasculitis could be induced by vaccine-associated auto-immune reaction.⁶ Vaccine adjuvants can induce the formation of autoantibodies or inflammation (localized or systemic). While cases of vasculitis after COVID-19 vaccination have been reported, the pathogenesis of thrombosis in this case could be attributed to vaccine-induced inflammatory or hypercoagulable state on the retinal vascular system.

Although vaccination is an essential tool to prevent the high mortality and morbidity associated with COVID-19, our study calls for the importance of monitoring ocular adverse events.

Declaration of consent

Written consent to publish was obtained from the patient.

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Conflict of interest

None declared.

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