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Case report

Foveal neovascularization in combined branch retinal vein and artery occlusion

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ABSTRACT

Purpose: To describe a case of combined branch retinal vein and artery occlusion (CBRVAO) complicated by foveal neovascularization (FNV).

Observations: A 52-year-old healthy woman presented at the Eye Clinic of Sacco Hospital (Milan, Italy) with a 3-year history of CBRVAO in her right eye. At baseline, her visual acuity was 20/20 Snellen with unremarkable anterior segment and normal intra-ocular pressure. On fundoscopy, a reddish foveal lesion with an underlying crescent-shaped pre-retinal subhyaloid hemorrhage could be appreciated. FNV was confirmed by means of fluorescein angiography and optical coherence tomography angiography; no signs of macular edema were present.

The patient was treated with two intravitreal injections of anti-VEGF agents and with completion of scatter retinal photocoagulation. At her last follow-up (6 months later), shrinkage of FNV and resorption of the pre-retinal subhyaloid hemorrhage were documented by means of multimodal imaging.

Conclusions and importance: FNV is a rare clinical finding that can complicate retinal vascular disorders and can be effectively managed with good visual outcomes. Our case highlights the importance of multimodal imaging to diagnose FNV in retinal vaso-occlusive disorders and then to assess the response to treatment during the follow-up.

1. Introduction

Retinal neovascularization is a complication of ischemic retinopathies and can be associated with poor visual outcomes.[1] The therapeutic options available for the management of retinal neovascularization include laser photocoagulation of the areas of non-perfusion and intravitreal injections of anti-vascular endothelial growth factor (anti-VEGF) agents.[2] Foveal neovascularization (FNV) is a rare clinical finding in retinal vascular disorders since the fovea is an avascular tissue and the underlying choroidal vasculature generally compensates for the macular ischemia.[3–5]

Hereby we report the multimodal imaging features of a case of combined branch retinal vein and artery occlusion (CBRVAO) complicated by FNV and treated with a combined approach.

2. Case report

A 52-year-old healthy Caucasian woman with a history of CBRVAO in her right eye since June 2017 presented at the Eye Clinic of Luigi Sacco Hospital (Milan, Italy) in April 2020. Since diagnosis she had undergone laser photocoagulation for retinal ischemia and 8 injections of intravitreal anti-VEGF agents due to macular edema. The approval was obtained from the Institutional Review Board of Luigi Sacco Hospital, and the research followed the tenets of the Declaration of Helsinki. The patient provided written informed consent for the clinical information included in this report.

At baseline examination, her visual acuity was 20/20 in both eyes with unremarkable anterior segment and normal intraocular pressure. Fundus examination of her left eye was normal whereas the right eye was characterized by a dilation and whitening of the supero-temporal retinal vein with corresponding severe arterial narrowing. Moreover, a crescent-shaped pre-retinal subhyaloid hemorrhage could be appreciated at the posterior pole just inferiorly to a reddish foveal lesion. Optical coherence tomography (OCT) documented a significant retinal thinning in the supero-temporal quadrant with no evidence of macular edema (Fig. 1). Fluorescein angiography (FA) confirmed the diagnosis of

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CBRVAO showing multiple residual areas of retinal non-perfusion in the temporal periphery and FNV in the absence of other retinal neovascularizations elsewhere (NVE) (Fig. 2). On OCT angiography the FNV appeared as an irregular epi-retinal hyperreflective structure piercing through the internal limiting membrane at the superior perifoveal edge with the evidence of flow on structural B scan. The choriocapillaris was not considerably affected, displaying minimal flow voids in correspondence with areas of macular ischemia (Fig. 2).

The patient was treated with two monthly intravitreal injections of anti-VEGF and with completion of scatter retinal laser. A comprehensive hematological, metabolic and immunological screening with cardiovascular risk assessment was also requested and summarized in Table 1.

During the follow-up gradual shrinkage of FNV with resorption of the pre-retinal subhyaloid hemorrhage was documented on multimodal imaging (Fig. 1). At her last visit in October 2020, visual acuity was still 20/20 with no signs of FNV leakage on FA (Fig. 2). The systemic work-up turned out to be negative.

3. Discussion/conclusions

CBRVAO is a retinal vascular disorder associated with severe systemic comorbidities that frequently complicates with retinal neovascularization generally growing at the optic disc or at the junction between the ischemic and the perfused retina.[6]

Our report represents the first description of FNV occurring in a retinal vascular occlusive disease and presenting with a subhyaloid hemorrhage in the absence of other NVE. A multimodal imaging approach turned out to be critical to perform a correct diagnosis and management of this patient. In particular, OCT angiography resulted a useful, non-invasive tool to detect the FNV and aided to differentiate the neovascular exudation from simple tractional leakage on FA. Moreover, the choriocapillaris segmentation showed that choroidal perfusion was unaffected in our patient (Fig. 2), therefore FNV was only the result of a severe macular ischemia caused by the CBRVAO.

Lastly, we achieved successful clinical outcomes with a combined therapeutic approach including retinal laser completion and intravitreal anti-VEGF injections, as testified by the resolution and lack of recurrence of the pre-retinal subhyaloid hemorrhage. This is in contrast to other reports present in literature that preferred simple retinal photocoagulation to induce regression of FNV.[3,4] Our decision was dictated by the good vision of our patient and the risk of causing vision-threatening consequences by extending the scatter laser to the macular areas of non-perfusion.

Patient consent

The patient consented to the publication of the case orally.

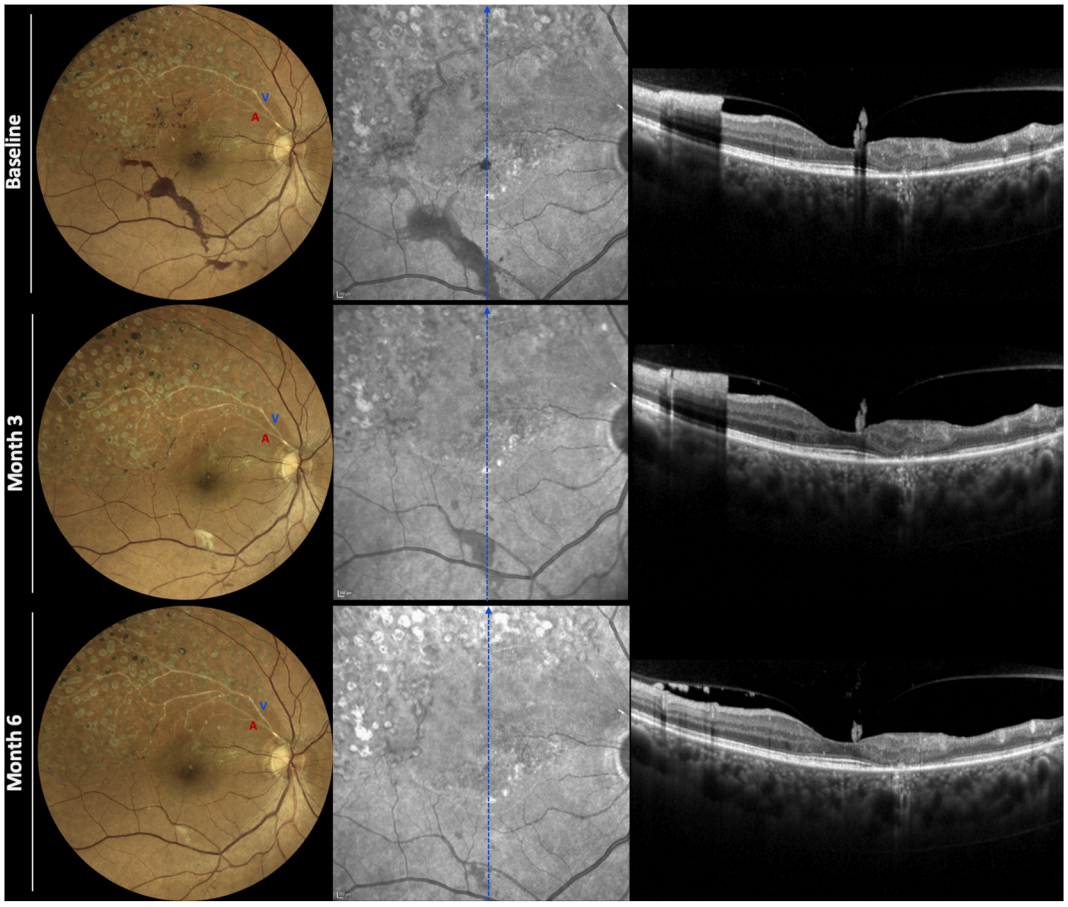

Fig. 1. Multimodal imaging of foveal neovascularization (FNV) in combined branch retinal vein and artery occlusion at baseline and follow-up.
(1st row) Baseline color fundus photograph shows tortuous and whitened retinal veins with arterial narrowing in the supero-temporal quadrant, a reddish foveal lesion and a pre-retinal hemorrhage following a gravitational pattern. Optical coherence tomography (OCT) documents an epi-retinal hyperreflective structure in correspondence of a hypo-reflective round lesion on near-infrared reflectance image.
(2nd-3rd rows) During the follow-up, the FNV gradually shrinks in size on OCT with resulting disappearance of the reddish foveal lesion; progressive resorption of the pre-retinal hemorrhage can also be noticed.
A and V refer to the occluded artery and vein, respectively. . (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

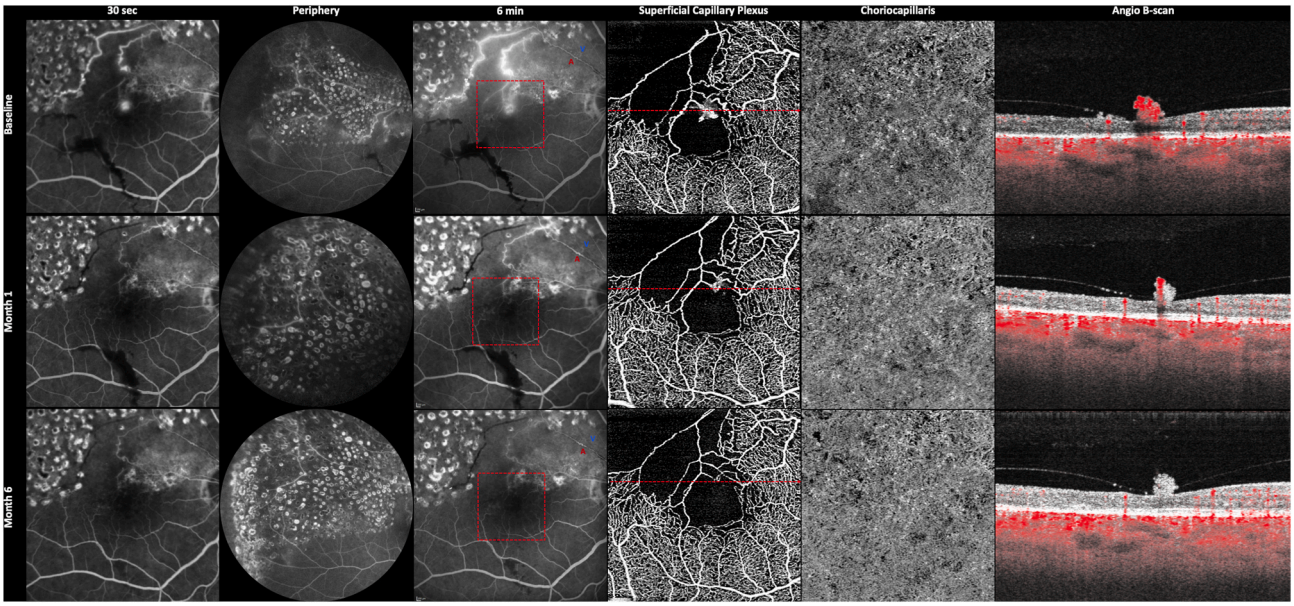

Fig. 2. Angiography studies of foveal neovascularization (FNV) in combined branch retinal vein and artery occlusion.
(1st row) Baseline fluorescein angiography (FA) demonstrates areas of retinal non-perfusion extending to the macular region and early leakage from a foveal neovascular complex that gradually expands during the late phases. Remaining areas of capillary non-perfusion with perivascular leakage are present in the temporal periphery. On the 3x3-mm optical coherence tomography angiography (OCT-A), capillary loss with enlargement of the foveal avascular zone on of the superficial capillary plexus with growth of a FNV can be noticed; choriocapillaris appears relatively unaffected.
(2nd row) Significant reduction of FNV-related leakage can be noticed on FA one month after receiving the first intravitreal injection of ranibizumab and the completion of scatter laser.
(3rd row) At 6 months, no sign of FNV is visible on FA and on OCT-A with the disappearance of flow on the structural B scan.
A and V refer to the occluded artery and vein, respectively.

Table 1
Comprehensive assessment of potential risk factors.

Risk Factors Assessment		
Hematologic/ Metabolic	Immunologic	Cardiovascular
Complete Blood Count	ANA, ENA antibodies	Cardiology visit with ECG
Glycemia, lipid profile	Factor V Leiden	Echocardiography
Coagulation (PT, aPTT)	Prothrombin gene mutation	Carotid doppler ultrasound
SP electrophoresis	Protein C/S deficiency	24-h BP Holter monitoring
Liver and renal function	Antithrombin deficiency	
CRP, ESR	Antiphospholipid antibodies	

Legend: PT, prothrombin time; aPTT, partial thromboplastin time; SP, serum protein; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; ANA, anti-nuclear antibodies; ENA, extractable nuclear antigen; ECG, electrocardiography; BP, blood pressure.

Conflicts of interest

GS, Heidelberg Engineering, Optos, Optovue, Centervue, Allergan, Bayer, Genetech, Novartis, Quantel Medical, Carl Zeiss Meditec, Boheringer, Topcon and Roche. MP, Heidelberg Engineering, Optovue, Bayer and Novartis. FR and CP have no relevant relationships to disclose.

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Intellectual property

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

Research ethics

We further confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

Authorship

All listed authors meet the ICMJE criteria. We attest that all authors contributed significantly to the creation of this manuscript, each having fulfilled criteria as established by the ICMJE.

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Declaration of competing interest

No conflict of interest exists.

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