



# Branch retinal artery occlusion (BRAO) after macroaneurysm

Kevin J. Toolan<sup>a</sup>, Samuel Minaker<sup>b,c</sup>, Joseph Civantos<sup>b,c,\*</sup>

<sup>a</sup> Department of Ophthalmology, University of Washington, Seattle, WA, USA

<sup>b</sup> Department of Ophthalmology, Rush University, Chicago, IL, USA

<sup>c</sup> Illinois Retina Associates, Chicago, IL, USA

## 1. Case

A 78-year-old woman with hypercholesterolemia presented with bilateral blurry vision. Visual acuity Dsc was 20/50 OD and 20/150–1 OS. Fundoscopy revealed a large retinal artery macroaneurysm (RAM) past the second arterial bifurcation of the superior-temporal arcades, with surrounding subretinal fluid and intraretinal hemorrhage. Retinal whitening was observed along a distal branch artery (Fig. 1). OCT demonstrated retinal elevation with macular involvement consistent with subretinal fluid (Fig. 2). Fluorescein angiography (FA) showed complete arterial filling defect of the superior-temporal branch retinal artery distal to the RAM in the early-stage, with a filling front visible proximally. In the late-stage, fluorescein leaked nearby the RAM (Fig. 1). After one-time *anti*-VEGF injection and focal laser OS, vision improved

to Dsc 20/100 + 2 PH20/50 + 2 in one month. Over a year and five months, vision further improved to Dsc 20/50 + 2 PH20/25–2, with OCT showing progressive retinal flattening and thinning (Fig. 2). Six months later, vision declined to Dsc 20/100 + 1 PH20/30 + 1. This was attributed to cataract progression, as there was no evidence of macular edema.

## 2. Discussion

This report describes a case of a branch retinal artery occlusion (BRAO) following RAM and offers perspective into its natural history. Panton et al. first noted that 8 % of patients with macroaneurysms developed BRAO.<sup>1</sup> Inflammation associated with local vessel wall healing and vasoconstriction may explain cases of arterial occlusion

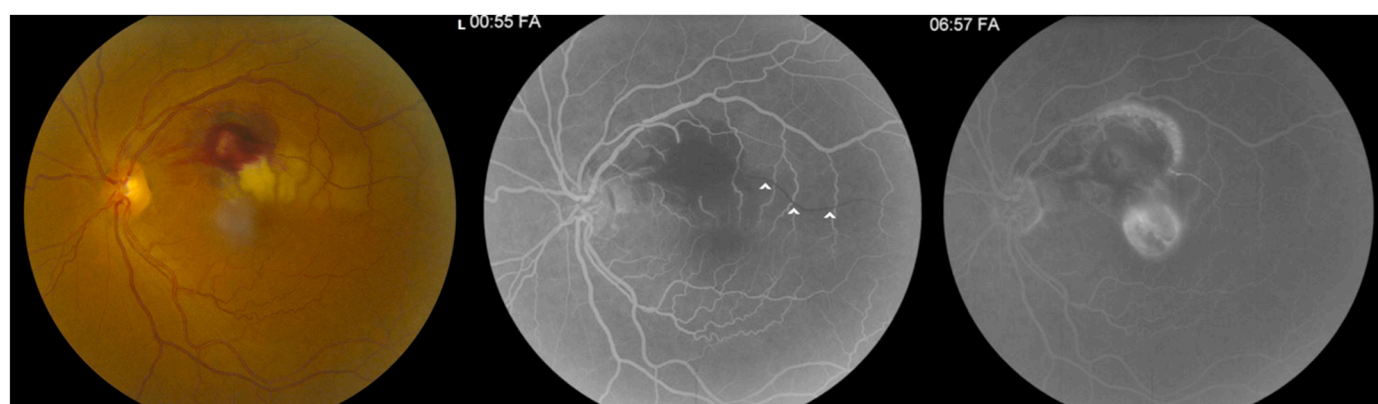


Fig. 1. Left Retina, Pre-treatment.

[Left] Fundus photograph with mid-phase [middle] fluorescein angiography (FA) illustrating branch retinal artery occlusion [arrow heads] distal to macroaneurysm. [Right] Late-phase FA demonstrating fluorescein leak near RAM.

\* Corresponding author.

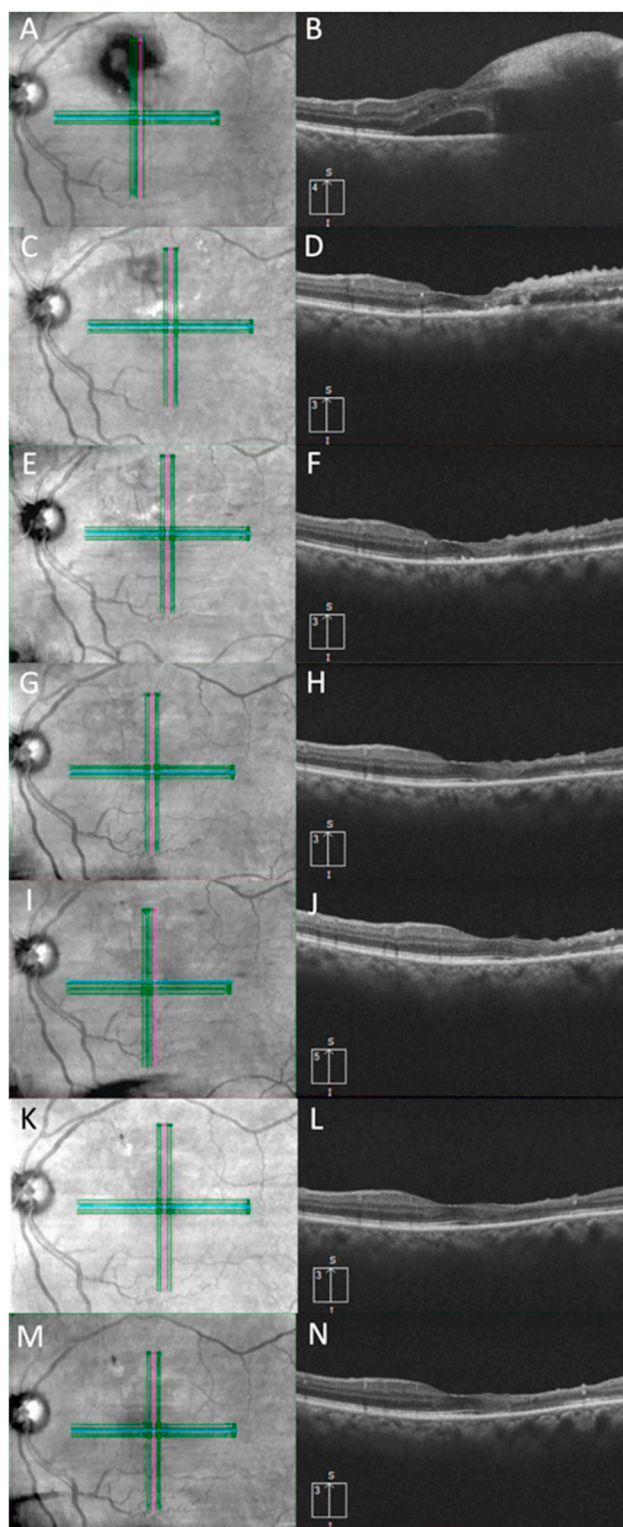
E-mail address: [jcivantos@illinoisretina.com](mailto:jcivantos@illinoisretina.com) (J. Civantos).

<https://doi.org/10.1016/j.ajoc.2024.102108>

Received 13 September 2023; Received in revised form 14 June 2024; Accepted 29 June 2024

Available online 14 July 2024

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**Fig. 2.** Optical coherence tomography (OCT) scans of the patient's left eye at various follow-up timepoints.

[A,B] 2-23-2022: Retinal macroaneurysm, macular edema, subretinal fluid, and disorganization of retinal inner layers. VA: 20/150-1, PHNI.  
 [C,D] 4-13-2022: One month post-treatment. VA: 20/100 + 2, PH: 20/50 + 2  
 [E,F] 5-11-2022: VA: 20/100-2, PH: 20/40 + 1.  
 [G,H] 10-12-2022: VA: 20/80 + 2, PH: 20/30 + 2.  
 [I,J] 3-15-2023: VA: 20/60 + 2, PH: 20/25 + 2.  
 [K,L] 9-13-2023: VA: 20/50 + 2, PH: 20/25-2.  
 [M,N] 3-20-2024: VA: 20/100 + 1, PH: 20/30 + 1.

after macroaneurysm.<sup>2</sup> Alternatively, turbulent flow within a macroaneurysm may produce thrombosis and arterial occlusion. In this patient case, the proximal location of the macroaneurysm to the arterial filling defect follows this proposed pathway and supports macroaneurysms as a risk factor for branch retinal artery occlusion. While many cases of RAM present with angiographic hyperfluorescence, its absence does not exclude RAM, as blood in the pre-retinal layer may block the fluorescent signal, as in this case.

The prognosis of BRAO after RAM has not been clearly elucidated. One study reported improvement from count fingers to 20/200 in three months after two rounds of conbercept.<sup>3</sup> In this case, the patient received laser photocoagulation and one *anti*-VEGF injection, with visual acuity and OCT changes tracked over two years. Vision steadily improved, with correlate retinal flattening and reduced macular edema on OCT, despite some retinal thinning and some loss of architecture. She had significant vision improvement with pinhole, peaking at 20/25 + 2, likely due to her 3+ nuclear sclerotic cataracts. A decline in vision on 3/20/2024, despite stable retinal anatomy on OCT, is likely explained by worsening of her cortical cataract, as her vision drastically improved with pinhole.

### 3. Conclusion

Our current understanding of branch retinal artery occlusion focuses on thromboembolic phenomena commonly attributed to fibro-platelet, calcific, or cholesterol induced arterial narrowing. This case supports an alternative pathway involving turbulent flow within the macroaneurysm leading to branch retinal artery occlusion. It also illustrates the potential for significant visual improvement in RAM-associated BRAO after *anti*-VEGF injection and focal laser treatment. Further research is needed to better understand the natural history and to optimize treatment strategies for RAM-associated BRAO.

### 4. Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

### Funding

No funding or grant support.

### CRediT authorship contribution statement

**Kevin J. Toolan:** Data curation, Writing – original draft, Writing – review & editing. **Samuel Minaker:** Conceptualization, Writing – review & editing. **Joseph Civantos:** Conceptualization, Writing – review & editing.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Acknowledgements and Disclosures

The following authors have no financial disclosures: KT, SM, and JC. All authors attest that they meet the current ICMJE criteria for Authorship. No funding was obtained for this case report.

## References

1. Panton RW, Goldberg MF, Farber MD. Retinal arterial macroaneurysms: risk factors and natural history. *Br J Ophthalmol*. 1990;74(10):595–600. <https://doi.org/10.1136/bjo.74.10.595>.
2. Lavin MJ, Marsh RJ, Peart S, Rehman A. Retinal arterial macroaneurysms: a retrospective study of 40 patients. *Br J Ophthalmol*. 1987;71(11):817–825. <https://doi.org/10.1136/bjo.71.11.817>.
3. Xie P, Feng W, Yan R, Zhu S, Gao X. Hemorrhagic retinal arterial macroaneurysm combined with branch retinal artery occlusion treated with intravitreal conbercept injection: a case report. *Medicine (Baltim)*. 2023;102(43), e35434. <https://doi.org/10.1097/MD.00000000000035434>.