Journal of VitreoRetinal Diseases
2025, Vol. 9(2) 228–231

DOI: 10.1177/24741264241294159
journals.sagepub.com/home/jvrd

Optical Coherence Tomography Angiography in Macular Neovascularization Secondary to Focal Choroidal Excavation

Riley C.T. Duke, MS[1], Shambhavi Anshumali, MD[1], and Jason N. Crosson, MD[2,3]

Abstract

Purpose: To highlight the use of multimodal imaging for detecting and monitoring macular neovascularization (MNV) in the presence of focal choroidal excavation. **Methods:** A case and its findings were analyzed. **Results:** Spectral-domain optical coherence tomography (OCT) and OCT angiography (OCTA) were performed in a 30-year-old Asian woman with metamorphopsia in the left eye. Imaging showed striking MNV secondary to focal choroidal excavation, and an impressive response to antivascular endothelial growth factor therapy was seen throughout the follow-up. **Conclusions:** OCTA is a noninvasive, useful imaging modality for diagnosing and monitoring patients with MNV secondary to focal choroidal excavation.

Keywords

OCT, OCT angiography, macular neovascularization, choroidal neovascularization, focal choroidal excavation, choroid, anti-VEGF agents

Introduction

The use of spectral-domain optical coherence tomography (SD-OCT) and OCT angiography (OCTA) to identify and monitor macular neovascularization (MNV) in the presence of focal choroidal excavation has only been reported in a few cases.[1–3] This report provides excellent SD-OCT and OCTA images from the initial presentation and follow-up of a case of MNV secondary to focal choroidal excavation treated with antivascular endothelial growth factor (anti-VEGF) therapy. Although anti-VEGF therapy for the treatment of MNV is well established, this case further supports the concept that MNV secondary to focal choroidal excavation can be diagnosed non-invasively with SD-OCT and OCTA (without fluorescein angiography [FA]) and that the resolution of MNV can be monitored with these multimodal imaging techniques.[2,3]

Case Report

A 30-year-old Asian woman with moderate myopia presented with new-onset metamorphopsia in the left eye. The best-corrected visual acuity (BCVA) was 20/40. Perifoveal focal choroidal excavation with outer retinal hyperreflective material consistent with MNV was seen on SD-OCT (Figure 1), and OCTA showed a flower-like net of MNV (Figure 2). Bevacizumab (1.25 mg/0.05 mL) was given at the patient's initial presentation.

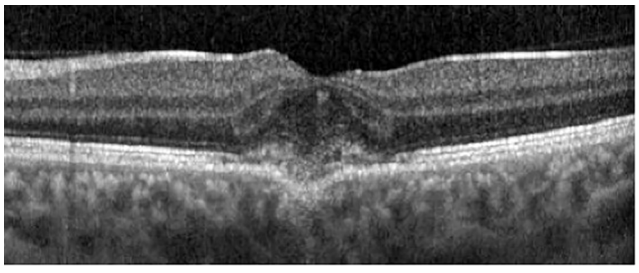

Figure 1. Spectral-domain optical coherence tomography at the initial presentation shows perifoveal focal choroidal excavation with outer retinal hyperreflective material consistent with macular neovascularization.

[1] The University of Alabama at Birmingham Heersink School of Medicine, Birmingham, AL, USA
[2] Department of Ophthalmology and Visual Sciences, The University of Alabama at Birmingham Heersink School of Medicine, Birmingham, AL, USA
[3] Retina Consultants of Alabama, Birmingham, AL, USA

Shambhavi Anshumali is now affiliated with Internal Medicine Residency, Department of Internal Medicine, University of Arkansas for Medical Sciences, Little Rock, AR, USA.

Corresponding Author:
Jason N. Crosson, MD, Retina Consultants of Alabama, 700 18th St S #707, Birmingham, AL 35233, USA.
Email: jcrosson@uab.edu

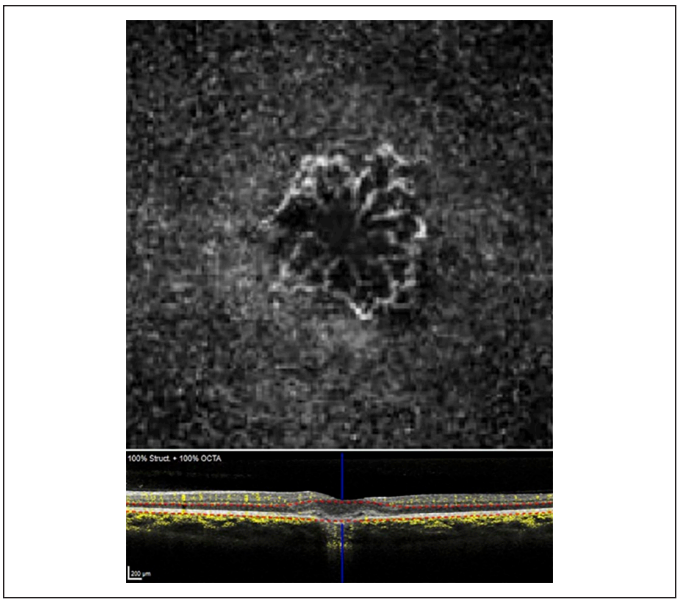

Figure 2. OCTA at the initial presentation shows a flower-like net of macular neovascularization. An avascular complex slab is shown with segmentation lines using viewing software from the Spectralis device (Heidelberg Engineering Inc).
Abbreviation: OCTA, optical coherence tomography angiography.

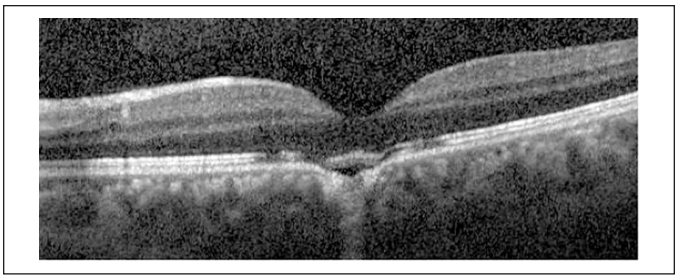

Figure 3. Four-week follow-up spectral domain-optical coherence tomography shows remarkable regression of macular neovascularization with some reconstitution of the outer retinal layers and resolution of outer retinal hyperreflective material after a single injection of bevacizumab at the initial clinic visit.

At the 4-week follow-up, SD-OCT and OCTA showed remarkable regression of MNV with some reconstitution of the outer retinal layers and resolution of outer retinal hyperreflective material (Figures 3 and 4). The BCVA had improved to 20/20. Bevacizumab (1.25 mg/0.05 mL) was again injected at this visit.

At the patient's final follow-up 8 weeks after initial presentation, SD-OCT and OCTA showed complete regression of MNV with further reconstitution of the outer retinal laminations (Figures 5 and 6). An injection of bevacizumab (1.25 mg/0.05 mL) at the patient's final follow-up visit completed a series of 3 anti-VEGF injections. The patient then moved to another state and was advised to follow up with a retina specialist in 4 to 6 weeks for continued monitoring of the focal choroidal excavation for MNV recurrence.

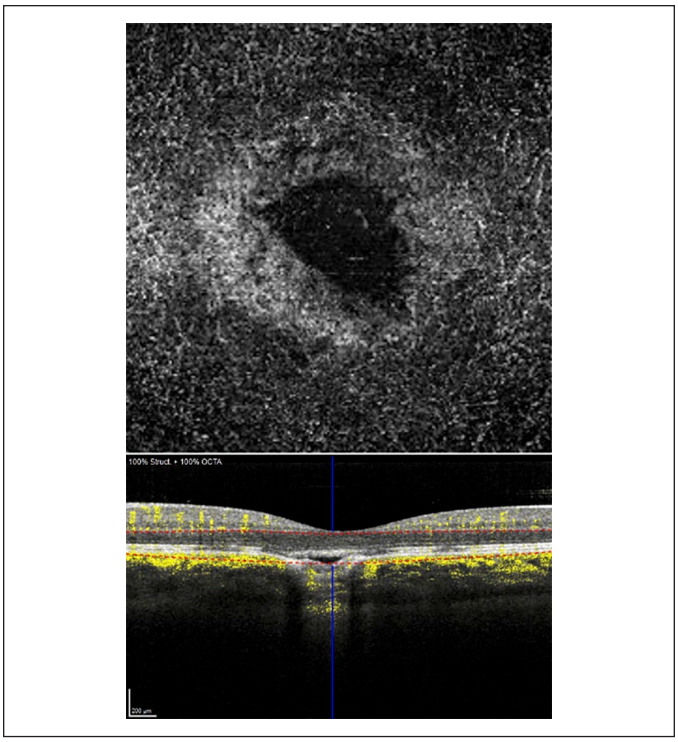

Figure 4. Four-week follow-up OCTA shows complete regression of macular neovascularization after 1 injection of bevacizumab at the initial clinic visit. An avascular complex slab is shown with segmentation lines using viewing software from the Spectralis device (Heidelberg Engineering Inc).
Abbreviation: OCTA, optical coherence tomography angiography.

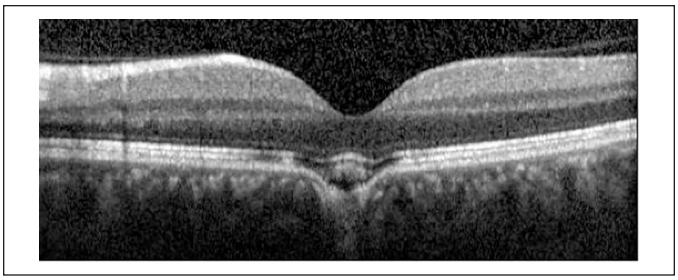

Figure 5. Spectral-domain optical coherence tomography at the second follow-up appointment (8 weeks after the initial presentation) shows further reconstitution of the outer retinal laminations after the second injection of bevacizumab.

Conclusions

Here, we present a case of focal choroidal excavation with visual symptoms attributable to MNV in the absence of other ocular pathology. The pathogenesis of this entity is not fully elucidated but in general can be idiopathic in nature or secondarily acquired.[1] Previous studies have shown that disruption of the interface of the retinal pigment epithelium, choroid, and Bruch membrane resulting from weakening of the retinal layers or loss of choriocapillaris may be the cause.[4,5] Gan et al[6] showed that the prevalence of focal choroidal excavation in clinical diagnoses is not

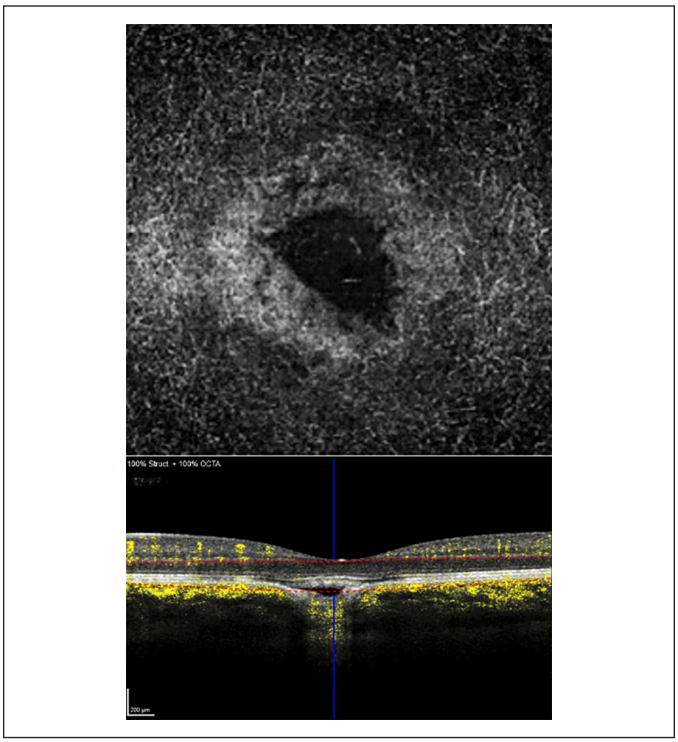

Figure 6. OCTA at the second follow-up appointment after the second injection of bevacizumab shows stable, complete regression of the flower-like net of macular neovascularization. An avascular complex slab is shown with segmentation lines using viewing software from the Spectralis device (Heidelberg Engineering Inc).
Abbreviation: OCTA, optical coherence tomography angiography.

insignificant and can occur with diverse chorioretinal diseases. Associated ocular conditions include myopia, central serous chorioretinopathy, age-related macular degeneration, punctate inner choroidopathy, and other choroidal inflammatory diseases.[2]

In our patient, there was no comorbid chorioretinal disease or anatomic predisposition other than moderate myopia, suggesting this was idiopathic focal choroidal excavation or arguably occurring secondary to myopia. However, the patient had no evidence of peripapillary atrophy or other signs to suggest myopic degeneration. The choroid had increased thickness on OCT imaging, and pachychoroid spectrum disorders were also considered as instigating conditions.

Although most focal choroidal excavation lesions are stable, some develop MNV. Previous studies support the hypothesis that the structure of focal choroidal excavation plays an important role in the development of MNV.[4,5] A long-term observational study by Zheng-Yu et al[7] found that 16% of focal choroidal excavation lesions developed MNV within the region, while Szabelska et al[8] found that 7% of patients (n = 1/14) in their case series had visual disturbance from MNV secondary to focal choroidal excavation. The patient in that study was followed with noninvasive OCTA and had a poor response when aflibercept was used as the anti-VEGF intravitreal injection.[8] In a study by Xu et al,[5] in all eyes with both focal choroidal excavation and MNV, the MNV lesions originated within the choroidal excavation or at the margin of the excavation.

It has been suggested that the structure of the choroidal excavation may result in outer thinning of the choroid and lead to ischemic and inflammatory changes in the underlying choroidal layers. Bruch membrane may also be weakened in the choroidal excavation, resulting in degeneration of the membrane and development of MNV.[2,4,5] In our case, similar to previous reports, the MNV was located at the margin of the focal choroidal excavation, creating a striking flower net–shaped neovascularization surrounding the excavation.

Previous studies have shown that MNV secondary to focal choroidal excavation responds well to anti-VEGF therapy, with most cases of MNV regressing after a single injection and with limited recurrence of the disease.[2,5] In our case, 1 injection of bevacizumab led to a significant reduction in outer retinal neovascularization by the 1-month follow-up. OCTA showed regression of the flower net of MNV, and SD-OCT showed resolution of the outer retinal hyperreflective material. This coincided with improvement in the BCVA from 20/40 to 20/20 after administration of bevacizumab. Although we hypothesize that a single injection might have been sufficient, 2 additional injections were given over 8 weeks to further suppress the MNV and prevent disease recurrence. This case highlights the use of SD-OCT and OCTA for diagnosing and following patients with MNV secondary to focal choroidal excavation without the need for FA.

In conclusion, anti-VEGF therapy is an effective treatment for MNV secondary to focal choroidal excavation. OCTA and SD-OCT are noninvasive and helpful tools for detecting MNV secondary to focal choroidal excavation and can produce striking images that are useful for monitoring the resolution of MNV.

Ethical Approval

This case report was written in accordance with guidelines for human studies and conducted in accordance with the World Medical Association Declaration of Helsinki. This retrospective review of patient data did not require ethical approval in accordance with local/national guidelines.

Statement of Informed Consent

Informed consent was obtained before treatment but was not required for publication of this case report given that this single retrospective case report involved non-identifiable images.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of the article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Riley C.T. Duke https://orcid.org/0009-0005-8219-3006

References

1. Chawla R, Mittal K, Vohra R. Optical coherence tomography angiography study of choroidal neovascularization associated with focal choroidal excavation. *Ophthalmic Surg Lasers Imaging Retina*. 2016;47(10):969-971. doi:10.3928/23258160-20161004-13
2. Zhu RL, Gu XP, Zhang YD, Yang L. Focal choroidal excavation complicated with choroidal neovascularization: a case report and review of the literature. *Int J Ophthalmol*. 2022;15(10):1717–1719. doi:10.18240/ijo.2022.10.23
3. Sánchez-Vicente JL, Rueda-Rueda T, Martínez-Borrego AC, et al. Focal choroidal excavaction associated with idiopathic choroidal neovascularization. *Arch Soc Esp Oftalmol (Engl Ed)*. 2018; 93(5):255–259. doi:10.1016/j.oftal.2017.03.008
4. Ferreira BFA, Preti RC, Schmidt MB, Zacharias LC, Takahashi WY, Monteiro MLR. Multimodal imaging of focal choroidal excavation complicated by choroidal neovascularization in a patient with angioid streaks and pseudoxanthoma elasticum. *Retin Cases Brief Rep*. 2021;15(2):155-162. doi:10.1097/ICB.0000000000000759
5. Xu H, Zeng F, Shi D, Sun X, Chen X, Bai Y. Focal choroidal excavation complicated by choroidal neovascularization. *Ophthalmology*. 2014;121(1):246-250. doi:10.1016/j.ophtha.2013.08.014
6. Gan Y, Ji Y, Zuo C, et al. Correlation between focal choroidal excavation and underlying retinochoroidal disease: a pathological hypothesis from clinical observation. *Retina*. 2022;42(2):348-356. doi:10.1097/IAE.0000000000003307
7. Zheng-Yu C, Lei S, Wen-Bin W. Morphological changes of focal choroidal excavation. *Graefes Arch Clin Exp Ophthalmol*. 2019; 257(10):2111-2117. doi:10.1007/s00417-019-04374-3
8. Szabelska P, Mędrzycka J, Brydak-Godowska J, Różycki R, Gołębiewska J. Focal choroidal excavation: epidemiology, clinical characteristics and multimodal imaging findings. *Diagnostics (Basel)*. 2023;13(4):602. doi:10.3390/diagnostics13040602