Choroidal Macrovessel Diagnosed on Multimodal Imaging, including Swept-Source Optical Coherence Tomography Angiography

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Abstract
Choroidal macrovessel (CM) is a rare anomalous vascular lesion in the choroid. In this case report, we describe a 72-year-old Caucasian man diagnosed with an incidental heavily branching CM in the macula of his right eye based on multimodal imaging, including enhanced depth imaging optical coherence tomography (OCT), swept-source OCT angiography, and indocyanine green angiography. Multimodal imaging is valuable in demonstrating the distinctive appearance of this entity and differentiating it from more vision-threatening differential diagnoses, such as ophthalmomyiasis interna, choroidal neoplasms, retinochoroidal anastomosis, and inflammatory conditions.

Introduction
Choroidal macrovessel (CM) is a rare anomalous vascular lesion in the choroid first described by Lima et al. [1]. The largest case series to date by Gallo et al. [2] demonstrated CM as a hyporeflective lesion occupying the entire thickness of the choroid along with the elevation of the overlying retina, and posterior displacement of choroid-scleral junction on
the enhanced depth imaging optical coherence tomography (OCT) [3]. Early filling without fluorescent leakage on indocyanine green angiography (ICGA) suggests the arterial nature of the entity. OCT angiography (OCTA) is a novel diagnostic modality in the diagnosis of CM noninvasively. There are about half a dozen case reports of CM described on OCTA in the literature [2, 4–7], of which only two reports described CM on swept-source OCTA (SS-OCTA) [2, 6]. We describe a CM in an asymptomatic emmetropic elderly Caucasian man on multimodal imaging, including SS-OCTA.

**Case Report**

A 72-year-old Caucasian man was referred for evaluation of a lesion in the macula of his right eye. On presentation, he was asymptomatic, and his vision was Snellen 20/20 in both eyes. The left eye examination was unremarkable. The right eye examination was notable for an orange-red, serpentine, track-like lesion inferior to the fovea that extended temporally to the equator, with associated overlying retinal pigment epithelium changes (Fig. 1a). Near-infrared image showed hyper- and hyporeflective spots along the lesion (Fig. 1b). ICGA demonstrated filling of the large branching lesion in the early phase suggesting an arterial
origin (Fig. 1c) and the lack of leakage in the late phase (Fig. 1d) ruled out choroidal inflammation. Enhanced depth imaging OCT through the lesion demonstrated its origin in the choroid-scleral junction elevating overlying retina (Fig. 2a) with scattered disruption of the Bruch’s/retinal pigment epithelium complex and few hyper-reflective foci in the outer retina (Fig. 2b). En face SS-OCTA (DRI OCT Triton; Topcon, Tokyo, Japan) imaging (Fig. 2c) with a custom slab through the entire thickness of the choroid (Fig. 2d) showed a large tortuous lesion with a similar signal as adjacent physiological choroidal vessels indicating similar flow velocity.

**Discussion**

CM is predominantly observed in the middle age to older Caucasian women [4]. However, there are reports in younger individuals: a 12-year-old reported by Turgut and Kobat [8] and a 27-year-old reported by Gallo et al. [2]. It can either be asymptomatic or can cause metamorphopsia due to foveal involvement [2, 4], often unilateral or rarely bilateral [2]. Our report demonstrates highly branching CM on ICGA, which was not previously described in the literature. OCTA is a novel diagnostic modality, to diagnose CM noninvasively. CM on SS-OCTA appears as large tortuous vessel with similar reflectivity as the adjacent physiological choroidal vessels; the “dark signals” may occur as the blood flow in these vessels is probably high and beyond the detectable threshold range creating a fringe washout artifact [9, 10]. Recently, high flow velocity in the CM was confirmed on laser speckle flowgraphy by Kataoka et al. [11]. We postulate that due to its location and posterior bulbous terminus with tapering anterior course, CM is an aberrant posterior ciliary artery, which could not travel anteriorly and anastomose. We anticipate that the newer enhanced depth imaging with longer wavelength OCTA can image choroidal vasculature and the choroidal lesions better in the future.

In summary, we report a case of heavily branching CM imaged with ICGA, heavily branching CM, which was previously not described in the literature. Multimodal imaging
including novel noninvasive SS-OCTA is valuable in demonstrating the distinctive appearance of this entity and differentiating it from more vision-threatening differential diagnoses, such as ophthalmomyiasis interna, choroidal neoplasms, retinochoroidal anastomosis, and inflammatory conditions.

**Statement of Ethics**

Written informed consent was obtained by the patient for publication of the details of his medical case and related images. It is the policy of the organization that a single case report or case series (three or fewer cases) does not constitute human subjects research requiring review and approval by the JHM IRB.

**Conflict of Interest Statement**

Dr. Arevalo receives grant support from Topcon Medical Systems, Inc. The authors Renuka Mopuru and T.Y. Alvin Liu of this manuscript do not have any conflict interest to declare.

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**Author Contributions**

R.M. drafted the manuscript. T.Y.L.A. gathered the pictures and contributed to the ideas of drafting this report. J.F.A. diagnosed the patient and reviewed the manuscript. All authors approved the final version of the manuscript for submission.

**Data Availability Statement**

All data related to this case report are included in the article. Further enquiries must be directed to the corresponding author.

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