

# **ZEISS Imaging Spotlight**

## Case compendium



Seeing beyond

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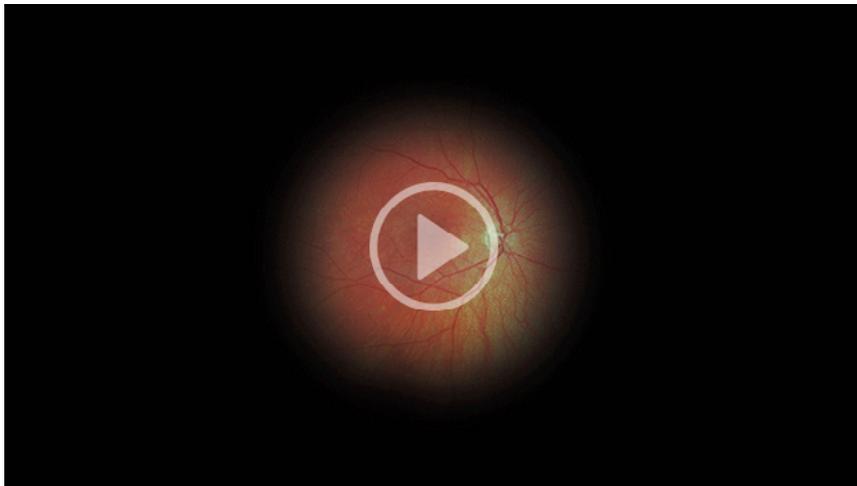
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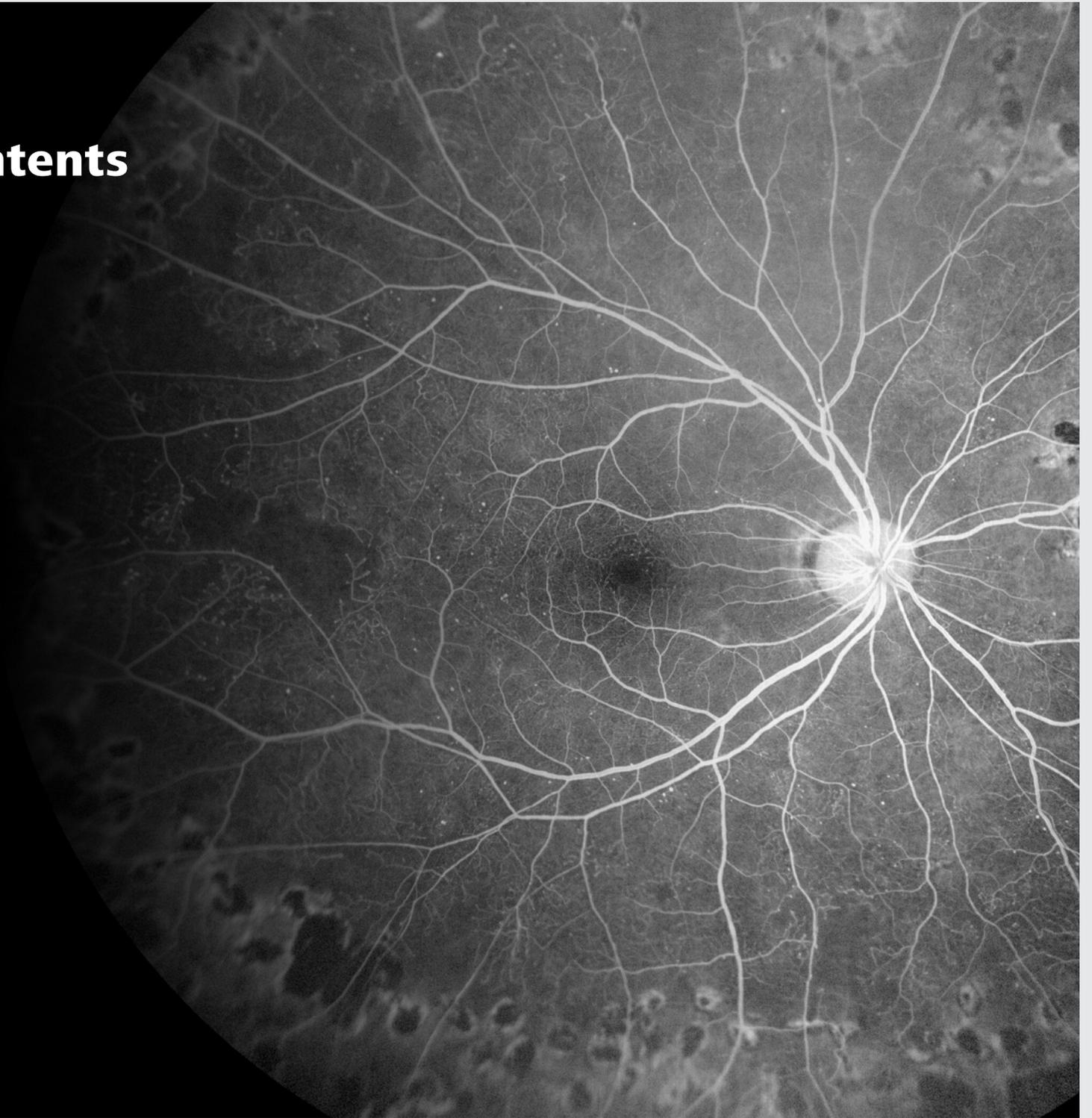
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# Introduction to ultra-widefield retinal imaging

The advent of widefield retinal imaging has shown us that indications of disease are often located in the far periphery of the retina. CLARUS® is the next-generation fundus imaging system from ZEISS that provides true color and high-resolution across an entire ultra-widefield image.



# Table of Contents





Seeing beyond

# Intraretinal microvascular abnormalities (IRMA)

Images and diagnoses courtesy of James Lai, MD

## Diagnosis

34-year-old Asian female with Diabetes Type II, Insulin Dependent. Low-risk Proliferative Diabetic Retinopathy (PDR), Intraretinal microvascular abnormalities (IRMA).

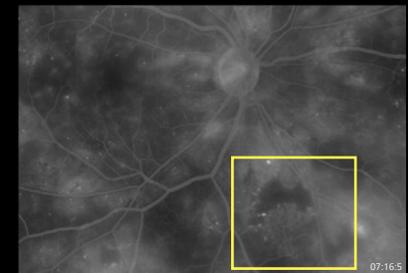
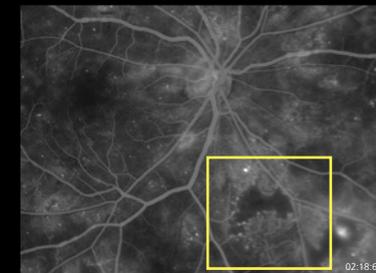
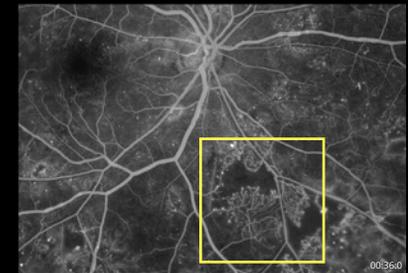
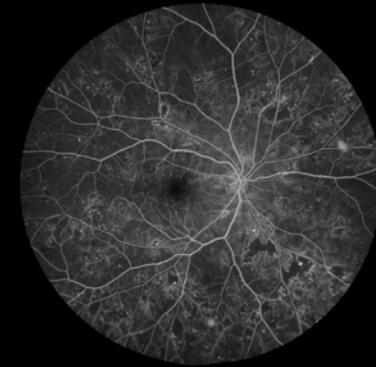
## Imaging

Images captured with the CLARUS® 700 from ZEISS provide a clear, high-resolution view across multiple imaging modalities, enabling visualization of tiny IRMA vessels and tiny microaneurysms.

## Detailed visualization

The True Color widefield image (1) shows IRMA with microaneurysms, exudates, dot and blot hemorrhages.

The fundus fluorescein angiography (FA) images (2) reveal hypofluorescence consistent with capillary drop out in all four quadrants, with a marked area in the inferior nasal quadrant.



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Seeing beyond

# Choroidal Melanoma

Images and diagnoses courtesy of Wills Eye Hospital, Carol Shields, MD

## Diagnosis

49-year-old Caucasian female presenting with sudden decrease in vision three weeks prior, which led to first eye exam in 10+ years. Hx of LASIK OU 15+ years prior; half-pack-per-day smoker for 29 years.

## Imaging modalities

**True color** imaging aids in the differential diagnosis of choroidal tumors versus simulating diseases, such as choroidal hemorrhages, and differentiation of the tumor type (metastatic tumors vs. primary melanoma vs. hemangioma).

**Fluorescein Angiography** continues the differentiation of tumor versus simulating disease as the choroidal blood flow can be seen beneath the retina.

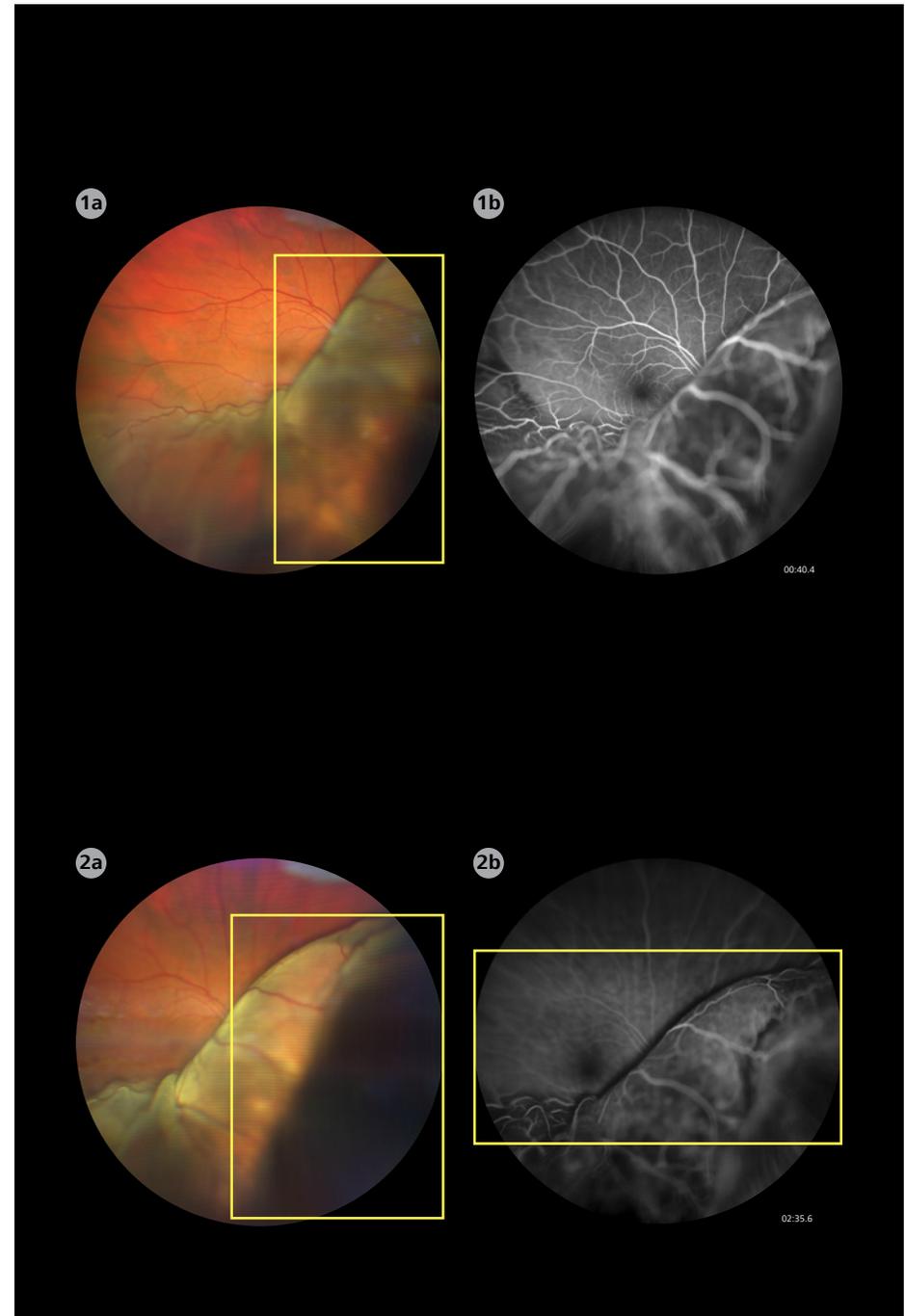
## Detailed visualization

The single, widefield True Color image captured on the CLARUS® 700 from ZEISS clearly shows the brilliant true color of the melanoma (1a).

Utilizing the PrecisionFocus<sup>1</sup> feature of the ZEISS CLARUS 700, the tumor in the retina is elevated and can be clearly observed in focus (2a).

The Fluorescein Angiography images reveal choroidal folds in the early phase (1b) and delayed arterial venous transit, which can be seen on the elevated tumor (2b). The inferotemporal serous RD is denoted by the folds.

**Clinical Findings:** Bi-lobed choroidal melanoma with the posterior portion overhanging the optic nerve and anterior portion invading the ciliary body, touching the lens (1a:2a, lower left dark area).



<sup>1</sup> PrecisionFocus feature allows you to quickly see the details in region of interest by selecting where to optimize focus, without losing the macula focal point.

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Seeing beyond

# Central Retinal Artery Occlusion OS (CRAO)

Images and diagnoses courtesy of James Lai, MD

## Diagnosis

63-year-old Caucasian female presenting with hypertension, hearing loss and Central Retinal Artery Occlusion (CRAO).

## Imaging

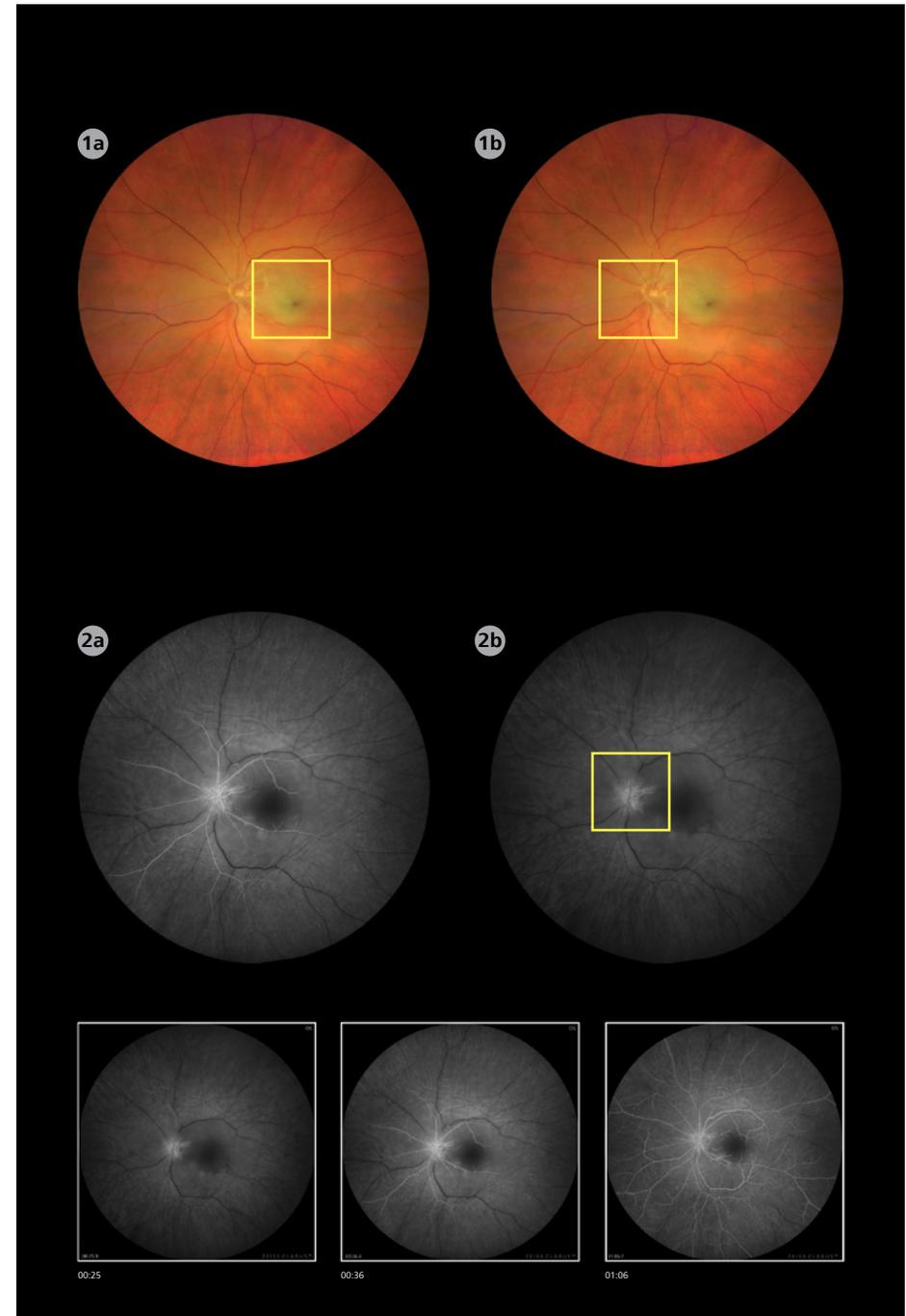
Utilizing the PrecisionFocus<sup>1</sup> feature of the CLARUS<sup>®</sup> 700 from ZEISS, the swollen nerve can be clearly observed in focus.

## Detailed visualization

The single widefield True Color image on the ZEISS CLARUS 700 clearly shows a cherry red spot (1a) and swollen nerve, choroidal folds (1b).

In the fundus fluorescein angiography (FA) images, the delayed arterial venous transit can be seen (2a), and leakage is revealed consistent with disc swelling (2b) and decreased arterial perfusion.

Choroidal folds are visible in the FA early phase (3, time code: 0:25 second).



<sup>1</sup> PrecisionFocus feature allows you to quickly see the details in region of interest by selecting where to optimize focus, without losing the macula focal point.

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Seeing beyond

# Optic Nerve Drusen

Images and diagnoses courtesy of Retina Consultants of Hawaii, Inc., Pali Momi Medical Center

## Diagnosis

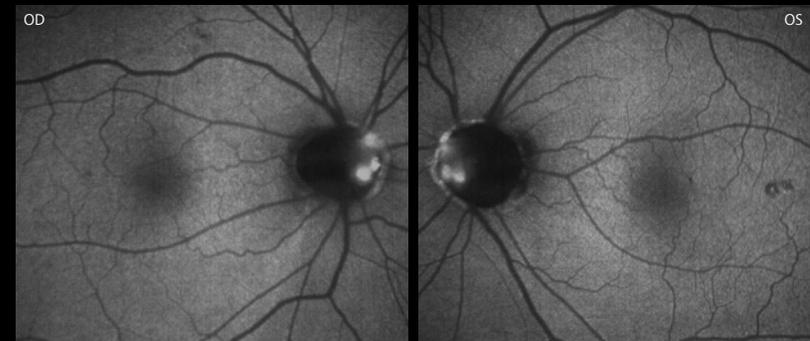
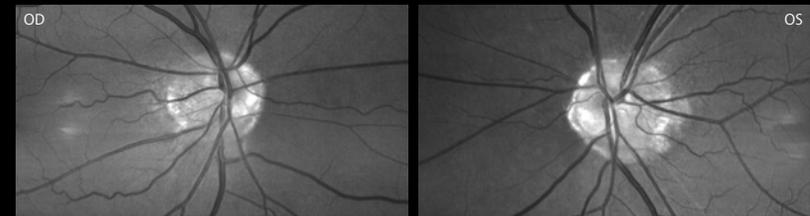
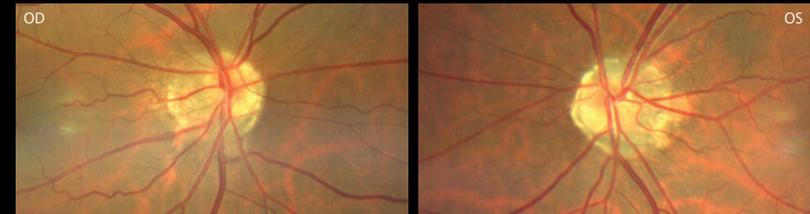
47-year-old Asian presenting with Optic Nerve Drusen in both eyes. No history of systemic disease.

## Imaging

The complete suite of imaging modalities and high-resolution zoom feature, PrecisionFocus<sup>1</sup>, of the CLARUS<sup>®</sup> 700 from ZEISS provide enhanced flexibility and visualization of the nerves.

## Detailed visualization

Images were captured (OD and OS) using three of the modalities available on the ZEISS CLARUS 700. The FAF-Green (3) and Green channel (2) images correlate with the widefield True Color image (1), highlighting the optic nerve drusen hyperautofluorescence nasal of the optic nerve.



<sup>1</sup> PrecisionFocus feature allows you to quickly see the details in region of interest by selecting where to optimize focus, without losing the macula focal point.

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Seeing beyond

# Retinal Tear

Images and diagnoses courtesy of EyeRx, Benjamin M. Teller, OD

## Diagnosis

59-year-old male with several day history of decreased OD vision accompanied by flashes. Patient is diagnosed with rhegmatogenous retinal detachment with macula off (OD).

## Imaging modalities

This True Color image (figure 1) highlights the retinal tear and folds, overlying the gray area of the retina.

## Detailed visualization

ZEISS optics provide a consistently clear image across the fundus image. The seven micron resolution capability of the CLARUS® 500 allows for simultaneous detailed visualization of the peripheral retinal tear and detachment at the macula (figure 2).





# Monitoring progression of co-existing conditions

Images and diagnoses courtesy of Carrot Eye Center, Mesa, AZ  
Michael Herion, MD, and Matthew Hammond, MD

## Diagnosis

91-year-old male S/P anti-VEGF injections OD with a history of diabetes, glaucoma and macular degeneration presents at three-month IOP follow-up with blurred vision OD. Vision OD decreased to CF at one foot from 20/80 three months prior.

## Clinical efficiency and patient comfort

The 133° widefield photo (figure 1) was captured effortlessly while this 91-year-old patient is stable with the head rest/chin rest. The detailed information of the retina is easily documented and tracked regarding this patient's glaucoma, macular degeneration and diabetic retina status.

## Serial comparison

The CLARUS Review software allows visualization of up to 16 images at once, facilitating ease in progression monitoring. The fundus image from the three-month follow up shows disciform scar formation (figure 2), representing advancement of end-stage wet AMD.

## Detailed visualization

The high 7 $\mu$ m resolution shows the distinct appearance of reticular pseudo drusen (figure 3). The yellowish subretinal lesions seen distinctly in these color images are prognostic markers for advancing disease, which historically color fundus photography picked up with low sensitivity.





Seeing beyond

# Asymptomatic Carotid Artery Stenosis

Images and diagnoses courtesy of Heron Eyecare, Adam Barron, OD

## Background

A 76-year-old, asymptomatic male presented for a routine eye examination. His medical and ocular histories were unremarkable except for an oral statin for hypercholesterolemia.

**Clinical Findings:** Fundus photography revealed a Hollenhorst plaque OD. An urgent carotid duplex showed carotid arteriolar stenosis of right 50-69%, left 15% due to arteriosclerosis. Patient is awaiting surgical evaluation for right carotid endarterectomy.

## Clinical efficiency and patient comfort

The stability and comfort of an integrated head/chin rest and less than 0.2-second image acquisition minimized artifacts and facilitated a confident diagnosis of the Hollenhorst plaque. A quickly taken true color, widefield image of the retina uncovered a subtle, incidental finding, giving practitioners the opportunity to prevent a potentially life-threatening event (figure 1).

## Color accuracy

CLARUS widefield retinal photography revealed a 100µm bright yellow refractile lesion located at the bifurcation of a right superotemporal retinal arteriole (figure 2). Green LED channel separation enhanced the contrast of retinal vasculature, demonstrating that this lesion was inside the lumen of the retinal arteriole (figure 3). The enhanced color and clarity of the image supported the confirmation of a well-defined Hollenhorst plaque.



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Seeing beyond

# Inactive Proliferative Diabetic Retinopathy

Images and diagnoses courtesy of Jesse Jung, MD

## Background

Asian male presents with inactive proliferative diabetic retinopathy.

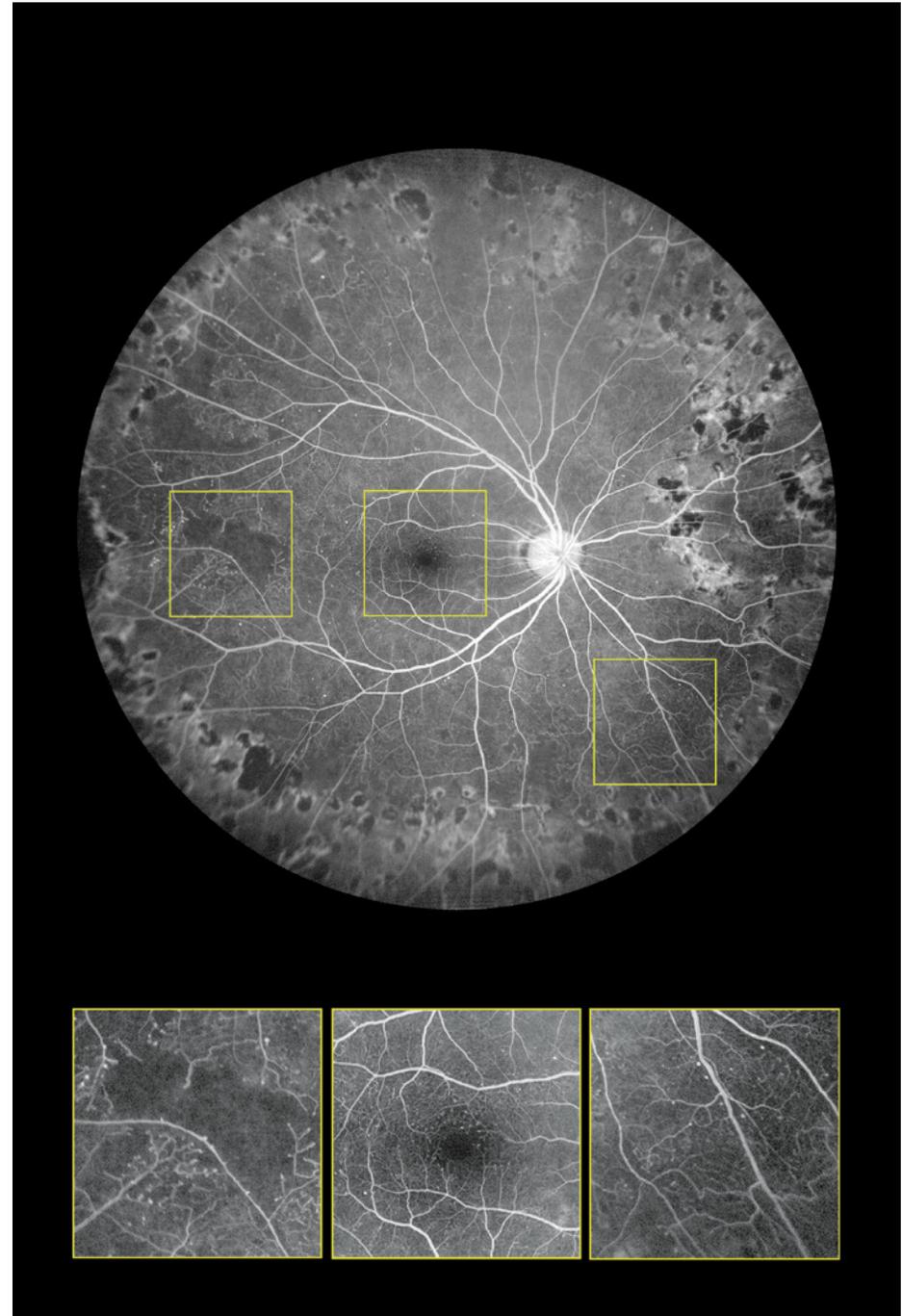
## Imaging with fluorescein angiography

When evaluating retinal and choroidal diseases, fundus fluorescein angiography (FFA) in an ultra-widefield view on the CLARUS® 700 from ZEISS helps determine any vascular leakage or non-perfusion. Its high-resolution images provide detailed visualization of the retina, which is important in cases such as diabetic retinopathy where subtle details can inform the diagnosis.

## Detailed visualization

A single image captured on the ZEISS CLARUS 700 provides a 133-degree field of view that encompasses the entire ETDRS 7 fields, making it easy to evaluate diabetic retinopathy (figure 1).

Microaneurysms, capillary non-perfusion (figure 2), macular ischemia (figure 3) and intraretinal microvascular abnormalities (figure 4) can be seen in great detail in the image.



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Seeing beyond

# Sickle Cell Retinopathy

Images and diagnoses courtesy of Roger Goldberg, MD

## Background

A 38-year-old African-American male, with neovascularization noted on routine imaging. The patient was asymptomatic, was not taking any medication, and was unaware of any systemic conditions.

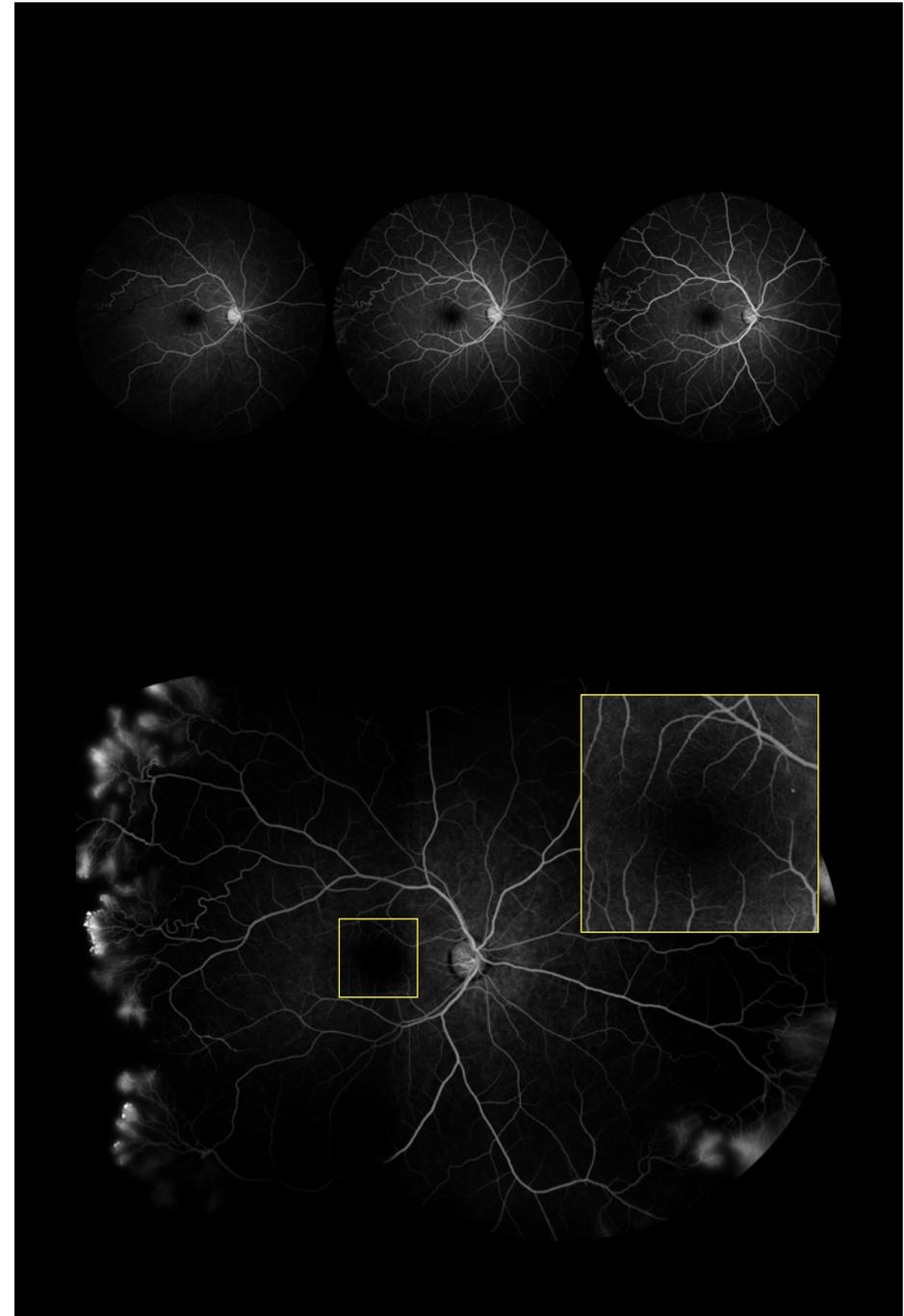
## Widefield imaging

CLARUS widefield images provide high-resolution angiography with a 133-degree field of view, enabling detailed visualization anywhere in the retina. This is especially important in diseases such as sickle cell retinopathy where both the macula and the peripheral retina can be affected.

## Detailed visualization

Vascular changes in the temporal retina can be seen on the fluorescein angiography (FA) images (figure 1) captured with the CLARUS® 700 from ZEISS.

The fluorescein angiography reveals extensive sea-fan neovascularization in the peripheral retina, characteristic of sickle cell retinopathy (figure 2). In addition, ischemic changes can be seen in the macular area, thanks to the excellent optical resolution of the CLARUS 700 (figure 3).





Seeing beyond

# Non-proliferative Diabetic Retinopathy

Images and diagnoses courtesy of Jesse Jung, MD

## Diagnosis

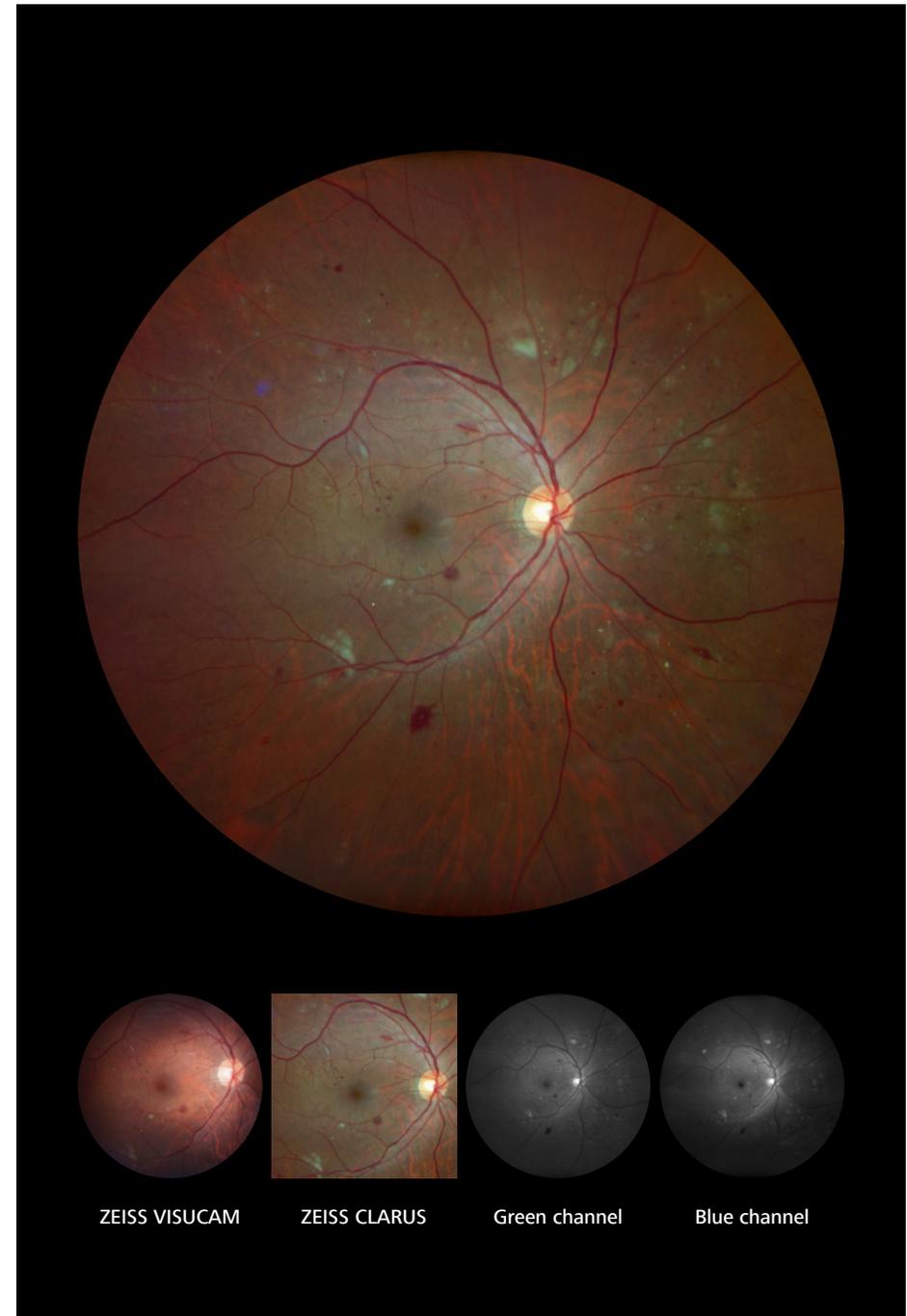
51-year-old male with non-proliferative diabetic retinopathy (NPDR). Scattered intraretinal hemorrhages, hard exudates and cotton wool spots are visible throughout the posterior pole. There is no neovascularization of the disc (NVD) or elsewhere (NVE) visible.

## Detailed visualization

The CLARUS true color, widefield image provides clear visualization of subtle retinopathy and neovascularization (1,3). With RGB Channel Separation, the green channel image (4) provides excellent contrast in the retina, especially of hemorrhages and microaneurysms. The blue channel image (5) highlights the anterior retina, making cotton wool spots more apparent.

## Traditional vs. CLARUS fundus imaging

- (1) CLARUS® widefield images retain the same quality as traditional fundus photos, with 7-micron resolution and true color, and the Broad Line Fundus Imaging (BLFI) technology ensures consistent exposure across the widefield image.
- (2) Traditional color fundus photo captured on the ZEISS VISUCAM 524.
- (3) ZEISS CLARUS image cropped to the same field of view as traditional fundus photography, 45 degrees.
- (4) Green channel image increases contrast of the retina, especially of hemorrhages and microaneurysms.
- (5) Blue channel image highlights the anterior retina, making cotton wool spots more apparent.



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# Non-proliferative Diabetic Retinopathy

Images and diagnoses courtesy of Jesse Jung, MD

## Background

71-year-old male with non-proliferative diabetic retinopathy and drusen.

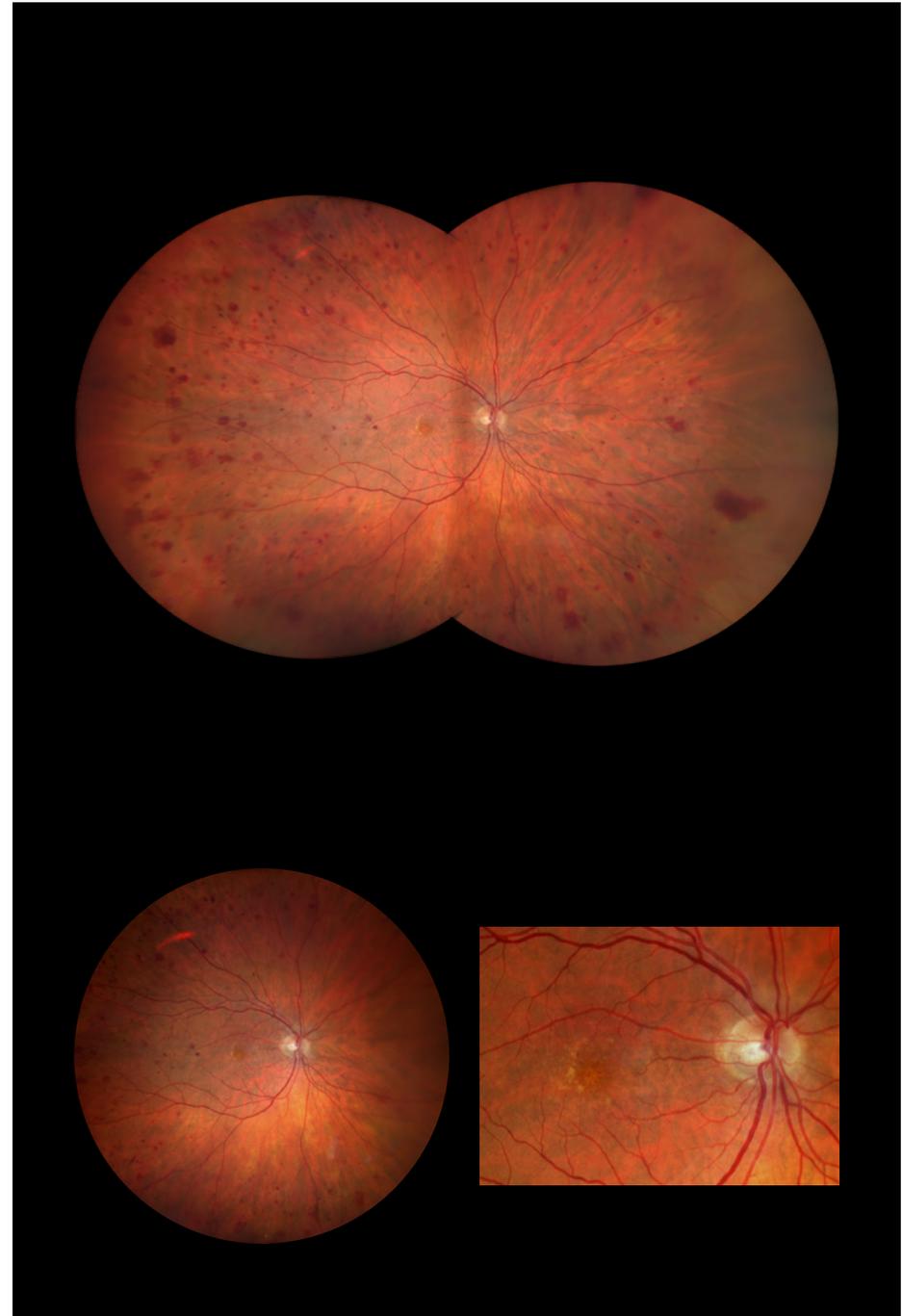
## Widefield and UWF imaging

The CLARUS® True Color Ultra-widefield image (figure 1) shows scattered dot and blot hemorrhages, mainly located outside the posterior pole. The CLARUS covers the ETDRS 7 standard fields in one single widefield image (figure 2), making it a valuable tool for diabetic eye exams and documenting retinopathy.

## Detailed visualization

The zoomed-in image of the posterior pole (figure 3) shows the excellent resolution and color of CLARUS images, allowing clear visualization of diabetic retinopathy, as well as the optic disc and macular drusen in a single image.

**Clinical findings:** It is important to remember that patients with diabetes often have many comorbidities, and a comprehensive evaluation of ocular health is essential. This patient has drusen and RPE pigment mottling at the macula. Studies have found that diabetes is associated with a significantly higher risk of primary open angle glaucoma<sup>1</sup>.



<sup>1</sup>Zhao D, Cho J, Kim MH, Friedman DS, Guallar E. Diabetes, Fasting Glucose, and the Risk of Glaucoma. Ophthalmology. 2015 Jan;122(1):72-8.

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# Dry Age-related Macular Degeneration with Choroidal Nevus

Images and diagnoses courtesy of Jay M. Haynie, OD, FAAO

## Background

92-year-old male presents with dry AMD and choroidal nevus in the right eye.

## True color, high resolution

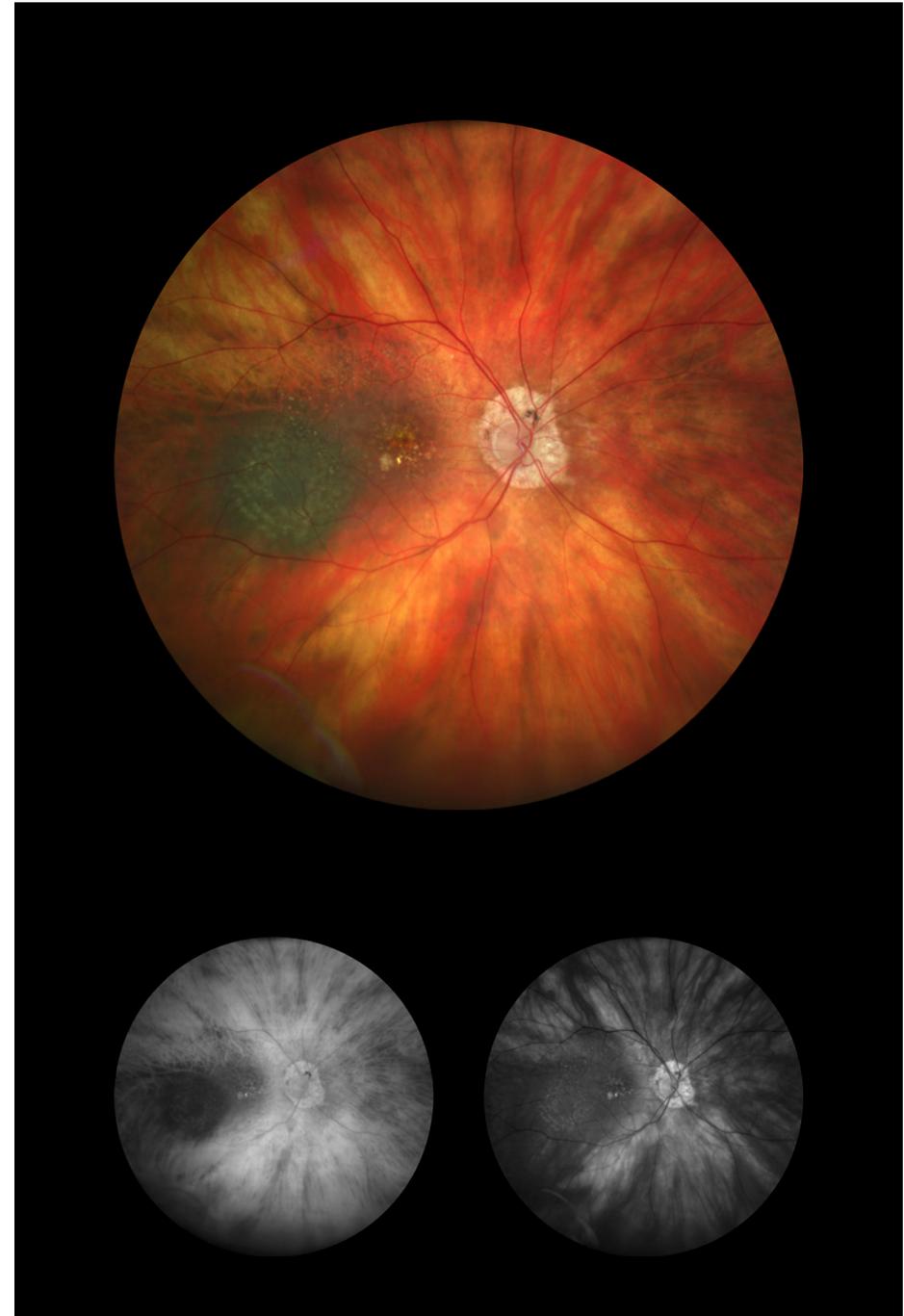
CLARUS images provide both true color and high resolution, which are important in cases where subtle color differences can inform the diagnosis.

**Clinical findings:** When evaluating pigmented choroidal lesions, melanoma should always be on the list of differentials. Although rare, choroidal melanomas can have devastating effects on the patient, so early detection is important. One of the risk factors for malignant transformation is orange pigment (lipofuscin)<sup>1</sup>.

## Detailed visualization

The true color, widefield image captured on the CLARUS<sup>®</sup> 500 from ZEISS (figure 1) reveals scattered drusen at the macula, along with some atrophic changes, and a gray-green choroidal lesion temporal to the macula with overlying yellow deposits.

With RGB channel separation, the lesion is clearly visible on the red channel image (figure 2) but disappears on the green (red-free) channel image (figure 3), indicating that the lesion is located in the choroid.



<sup>1</sup>Shields CL, Shields JA, Kiratli H, De Potter P, Cater JR. Risk factors for growth and metastasis of small choroidal melanocytic lesions. *Trans Am Ophthalmol Soc.* 1995; 93:259-275.275-279.

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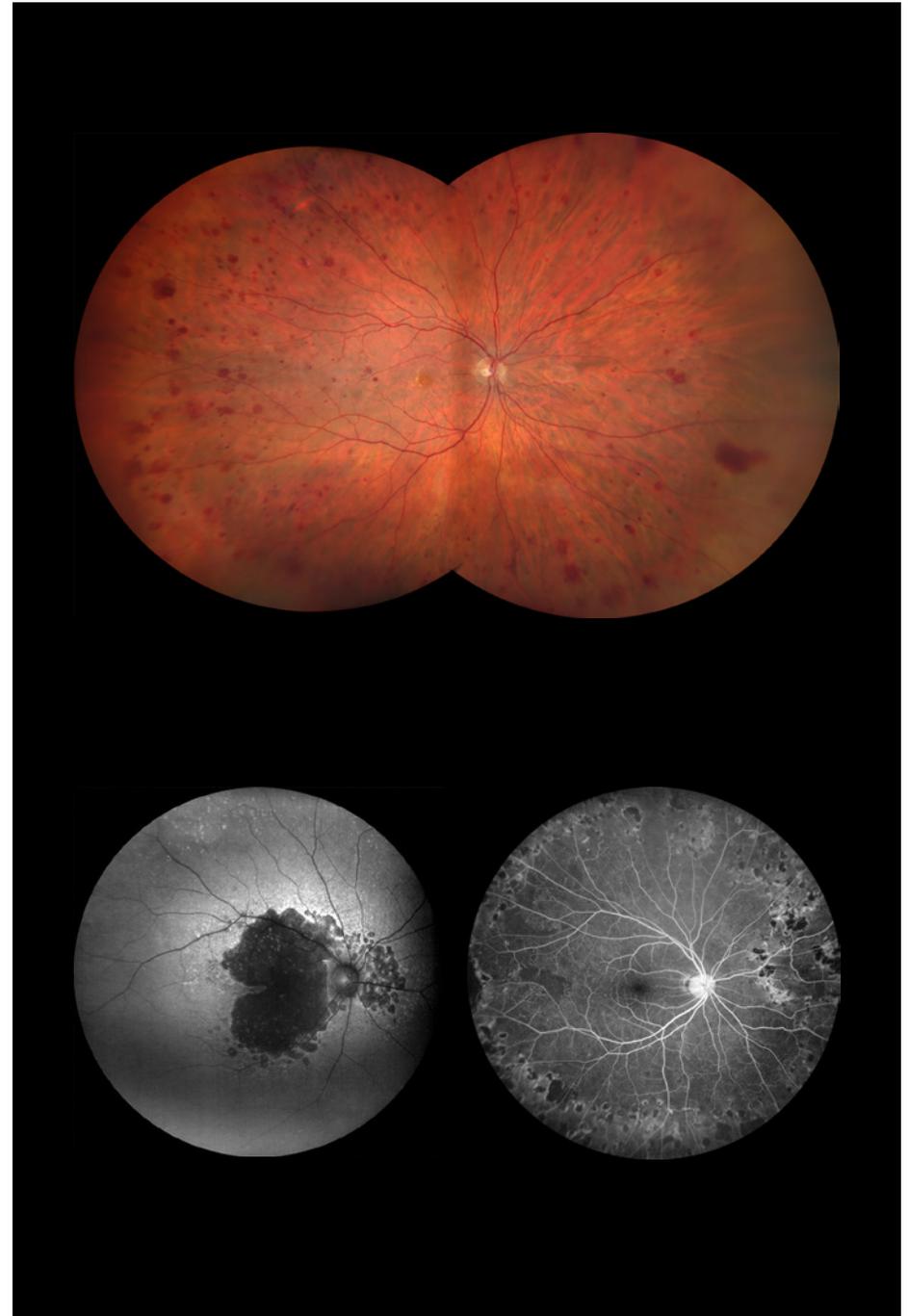
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