Laser Video ICG Angiography and SD-OCT for the Diagnosis of PCV and AMD

SD OCT and ICG angiography enhance understanding of PEDs in neovascular AMD

By David Sarraf, MD

Although fluorescein angiography (FA) and spectral-domain optical coherence tomography (SD-OCT) are mainstay modalities in the diagnosis of age-related macular degeneration (AMD), high-speed laser video indocyanine green (ICG) angiography still has a role in the management of neovascular AMD. ICG angiography can be critical in the identification of an occult choroidal neovascular (CNV) membrane and in the diagnosis of polypoidal choroidal vasculopathy (PCV).

DEEPER IMAGING

The longer wavelength ICG is nearly 100% albumin-bound and better penetrates pigment and blood, allowing the retinologist to detect hot spots associated with pigment epithelial detachments (PED) and/or hemorrhagic lesions and permitting localization of the CNV complex (Figure 1). Simultaneous SD-OCT imaging can further enhance localization of an occult CNV membrane and has become an essential tool in differentiating Type 1 (sub-PED), Type 2 (sub-neurosensory retina), and Type 3 (retinal angiomatous proliferation or RAP lesions) neovascular membranes (Figure 2).[1] Imaging of the sub-PED compartment is now routine practice with SD-OCT technology, and identification of lacy neovascular membranes and/or polyps on the undersurface of the retinal pigment epithelium (RPE) monolayer of the PED is important.

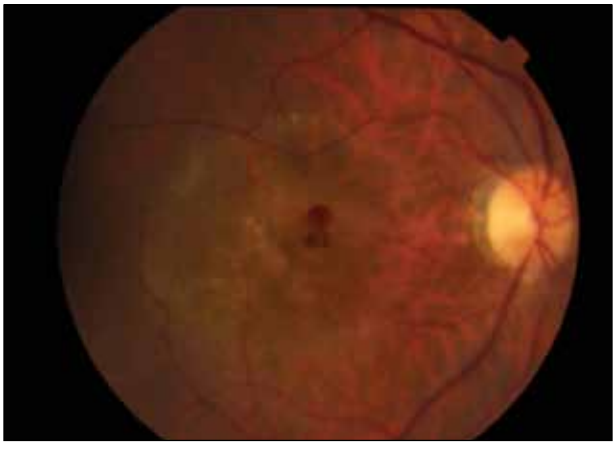

Figure 1. Color fundus photograph shows a hemorrhagic PED with intraretinal heme suggestive of a Type 3 RAP lesion.

NOVEL FINDINGS WITH ICG AND SD-OCT

Laser video ICG angiography remains a useful modality in identification of polyps, which are classified as Type 1 neovascular membranes and are considered a variant of neovascular AMD. Identification of polyps may have importance, as some cases of PCV can be resistant to anti-VEGF therapy, and certain studies have indicated that the combination of anti-VEGF injections with photodynamic therapy (PDT) may be the preferred modality for treatment of PCV.

Although ICG is an important imaging resource in selected scenarios, SD-OCT is an integral tool in all cases of macular disease and offers greater accuracy and precision for the diagnosis and management of AMD. I have been most comfortable employing the Spectralis SD-OCT (Heidelberg Engineering) system, which has allowed our group and our collaborators to identify various novel findings associated with vascularized PEDs in AMD and specifically to study the evolution of lesions in

the sub-PED compartment.

SD-OCT technology allows visualization of the CNV membrane complex in the sub-PED compartment. Although the CNV membrane complex may initially appear as a lacy or polypoidal-like lesion under the roof of the PED, with chronic anti-VEGF therapy an organized lamellar scar may develop in association with the CNV membrane complex imparting a multilayered appearance to the PED and associated with a more stable anatomic and visual prognosis.

SUMMARY

SD-OCT technology has enhanced our understanding of PEDs in neovascular AMD. Visualization of the CNVM complex in the sub PED compartment as a vascular or polypoidal network or in association with an intraretinal RAP complex is now possible. Chronic fibrovascular multilayered PEDs demonstrate an organized lamellar scar and portend a more favorable prognosis.

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1. Freund KB, Ho IV, Barbazetto IA, et al. Type 3 neovascularization: the expanded spectrum of retinal angiomatous proliferation. *Retina* 2008;28(2):201-211.

ICG Angiography Essential for PCV Evaluation and PDT

By Gregg T. Kokame, MD

Approximately 40% to 50% of my time is spent diagnosing and treating AMD. When I first diagnose a patient, I perform both fluorescein angiography (FA) and ICG angiography at the initial evaluation. The only way clinicians can accurately diagnose polypoidal choroidal vessels is with ICG angiography. My practice is in Hawaii, and the population is more than 50% Asian. PCV is more common in Asian populations, representing as many as 50% of the cases initially diagnosed as wet AMD. PCV also occurs surprisingly frequently in white populations, up to about 15%, so I feel it is important to evaluate for PCV at the time of initial evaluation for every AMD patient.

IMAGING FOR PCV

I use the Spectralis SD-OCT with point-to-point localization of OCT scans and high-speed laser video

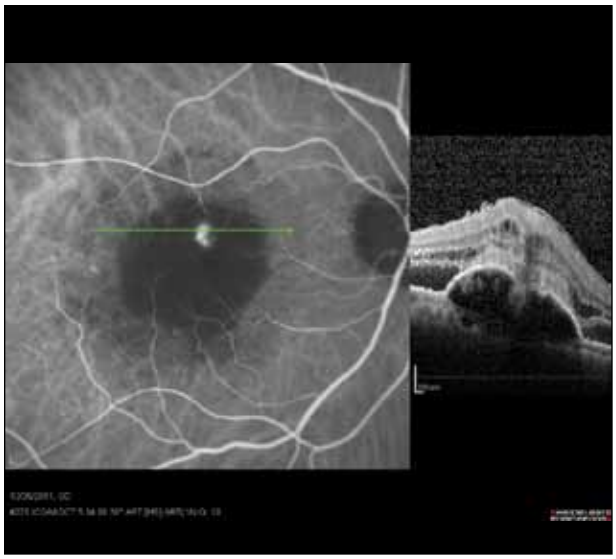

Figure 2. ICG-correlated OCT showing vascularized PED with intraretinal and subretinal fluid and associated RAP lesion. The RAP complex is registered to the hyperfluorescent hot spot shown with ICG angiography and appears to have a polypoid like component (visualized under the RPE monolayer of the PED) with SD OCT.

ICG angiogram to better identify PCV, which should be done within the first 4 minutes after injection with ICG dye. The polypoidal complex on OCT looks like a Type 1 subretinal neovascular membrane with elevation of the RPE from Bruch membrane. The Heidelberg platform allows me to view the OCT in the exact area identified by the ICG angiogram as part of the PCV complex.

When vision is significantly decreased, I carefully use the SD-OCT to look for significant macular edema, subretinal fluid, or sub-RPE fluid or blood. This instrument allows me to identify what I am looking at on the angiogram compared with what I am looking at on the OCT in a point-to-point comparison. Once I perform the FA and the ICG angiogram, then I can confirm the presence of subretinal neovascularization and associated PED (Figure 2). The findings of the FA will often show only occult CNV or a vascularized PED, which is usually indistinguishable from wet AMD (Figure 3). The video ICG angiogram, which is best seen with the confocal scanning laser ophthalmoscope on the Heidelberg system, is essential to visualize the branching vascular network and the polypoidal dilation of the subretinal vessels.

CHOOSING TREATMENT

The patient's level of vision helps to identify the best treatment option in PCV. Patients with good vision are

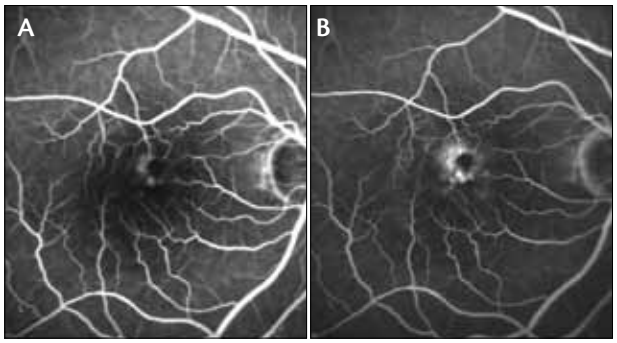

Figure 3. Early (A) and late (B) FAs show occult CNV with leakage, blocking defect from subretinal hemorrhage. The polypoidal complex on FA is indistinguishable from exudative macular degeneration.

often still treated with anti-VEGF therapy, as this can decrease the leaking and bleeding associated with PCV. If I feel that the vision is already somewhat weak and there is a significant polypoidal choroidal component, however, I then consider a combination of PDT with an injection of bevacizumab (Avastin, Genentech) or ranibizumab (Lucentis, Genentech) and dexamethasone. Combination therapy has been shown to be more effective anatomically in closure of PCV than anti-VEGF therapy alone. Combination therapy may also be utilized in eyes that are poorly responsive to anti-VEGF therapy and harbor PCV.

Unfortunately, ICG is not utilized frequently in the United States, and so many retina specialists are not familiar with using this imaging modality to identify PCV. Even excellent training programs in the United States do not yet appreciate the importance of ICG and its utility in diagnosing this disorder. Although I believe that ICG angiography should be utilized in the initial evaluation of all AMD patients, the higher risk factors that should increase the suspicion for PCV include Asian or black ethnicity, more subretinal fluid than intraretinal edema, large PED, and poor response to anti-VEGF therapy. It is in these patients that high-speed laser video ICG angiography is essential to evaluate for PCV and to help guide therapy with the use of ICG-guided PDT. ■

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