

Case Study Using SD-OCT

Looking for small changes with advanced imaging technology and pinpoint diagnosis.

BY MICHAEL BENNETT, MD

If you think of imaging today, it is really no secret that we are breaking ground when it comes to visualizing pathology. Imaging yields more specific identification, which in turn allows for more accurate treatment and follow-up.

On the imaging and diagnostic front, we can say with great certainty that the standard of care to date has been time-domain optical coherence tomography (TD-OCT). Only recently, however, have we seen widespread adoption of spectral-domain (SD) OCT, also known as fourier-domain OCT, which has higher resolution and significantly less motion artifact when compared to TD-OCT

technology. The underlying question beneath all of this is: How does this really affect a practice and are there benefits of incorporating SD-OCT technology into our daily practice? In addition, it is important to consider the relevance of these retinal diagnostic instruments as they relate to the physician-patient relationship. Diagnosis, more often than not, equals validation for the patients' chief complaint.

In my practice, I have been using the Spectralis HRA + OCT (Heidelberg Engineering, Vista, CA), which is one of the several SD-OCT technologies now available. I have found that I am able to obtain high-resolution images and

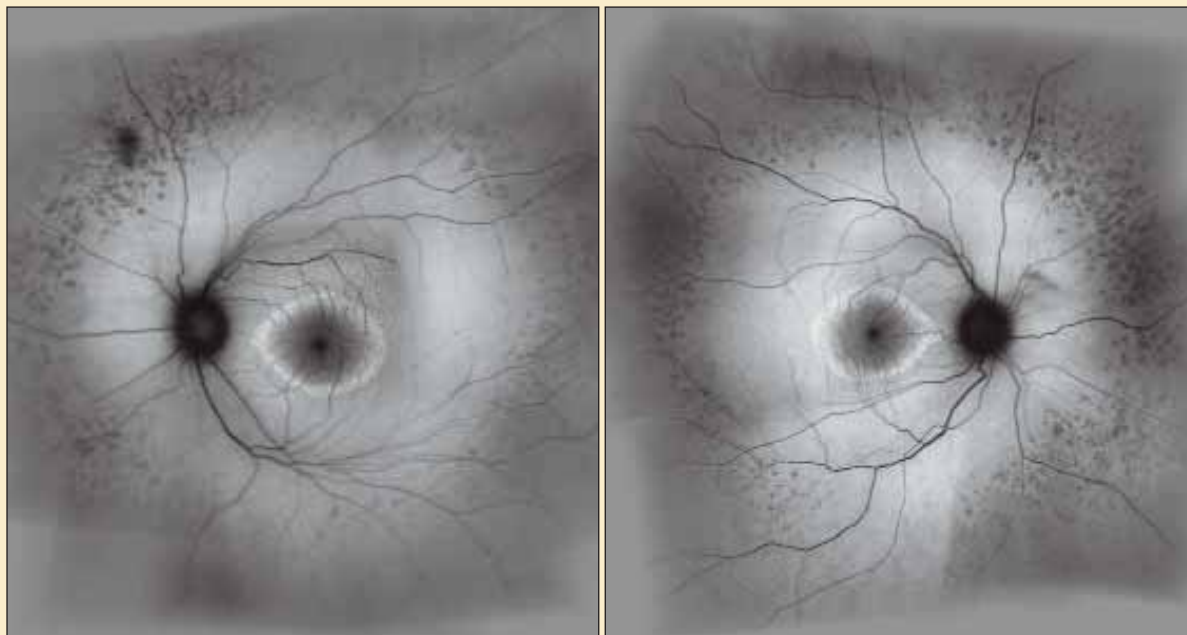


Figure 1. This widefield autofluorescence image reveals a distinct pattern of damage to the retinal pigment epithelium (RPE) not visible on clinical examination. An abnormally dark (hypofluorescent) area surrounds the fovea, with a circumferential lighter (hyperfluorescent) ring. Hypofluorescence is an indicator of absence of lipofuscin and malfunctioning RPE. The bright outer ring is believed to be an over accumulation of lipofuscin and an indicator of future damage to the RPE.

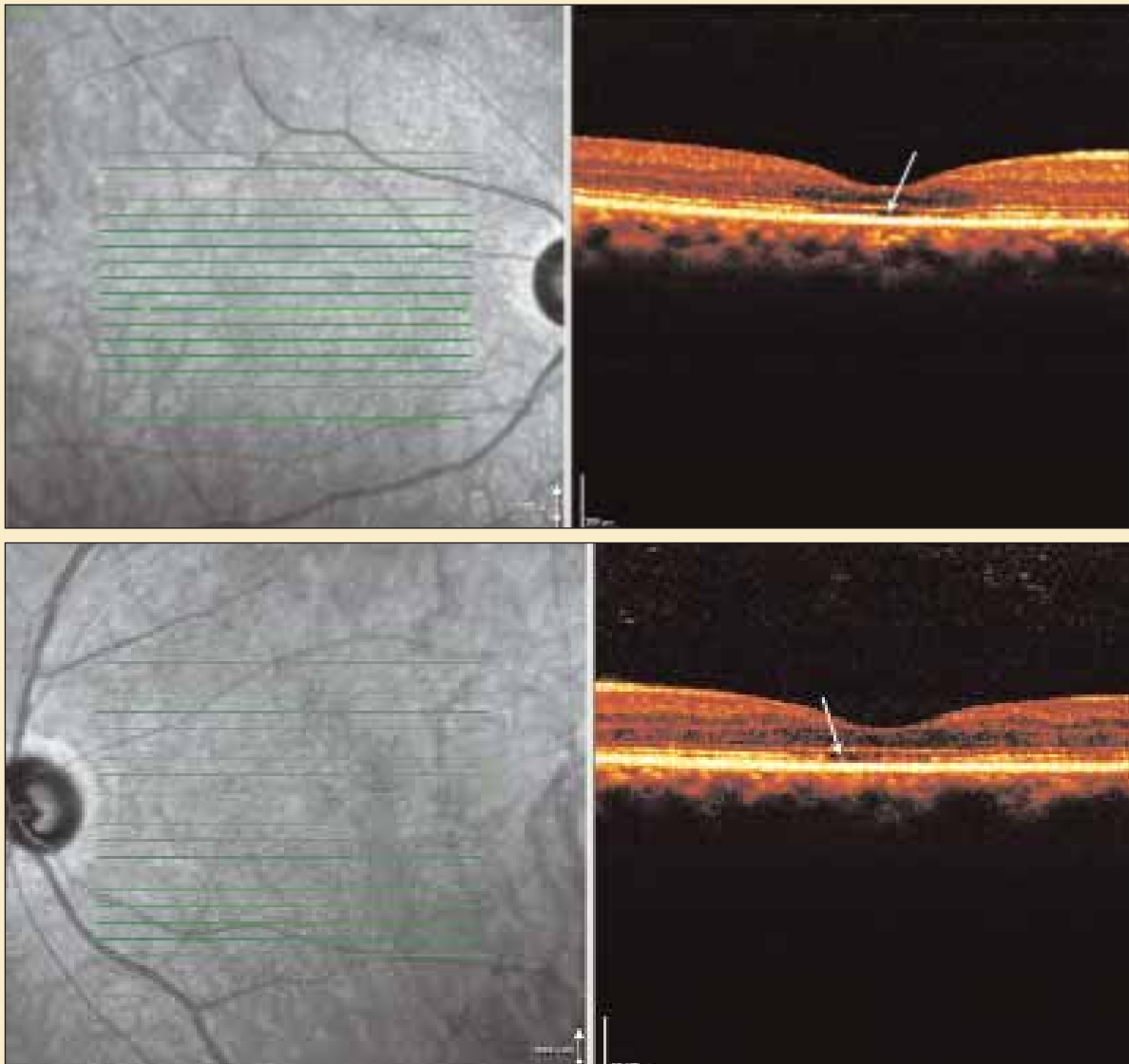


Figure 2. In this patient, fundus images and clinical examination only showed slight pigmentation alteration insufficient to explain vision loss. SD-OCT cross sectional images with Spectralis revealed highlights the region of the attenuated or degenerated, photoreceptor outer-segments. (Dark area interrupting the white band marked by white arrows).

differentiate well between the layers of the retina with the Spectralis. Additionally, I have found that SD OCT demonstrates far greater utility for diagnostic imaging than TD OCT. Diagnoses, treatments, and outcome measurements have all been affected by improved OCT imaging capabilities.

The following two cases are what I call “mirrored” cases, in which we were exploring deficiencies in patients’ outer segments (rods/cones) to explain what was not detected in previous visits to various clinicians. In each case, we found that SD-OCT technology allowed for pinpoint diagnosis validating the patients’ complaints.

CASE #1

The first case was a young man enlisted in the US Navy, who had plans and aspirations to make his enlistment a long, evolving career. When this individual would participate in overnight or on extended duties, however, he reported great functional difficulty. He would stumble, fumble, and was ultimately accused by his superiors of malingering. The patient, however, insists these difficulties were amplified, approaching incapacitation from dusk to dawn, or in other scotopic or inclement weather conditions. He was evaluated by a number of different

doctors and then finally referred to my practice. From a clinical standpoint, his vision was 20/15 uncorrected but his retina showed a light degree of pigmentary alteration. Once he was scanned with the Spectralis, however, I observed a condition similar to what one might see with rod degeneration—areas of altered autofluorescence were seen in the midperiphery (Figure 1). The resulting photoreceptor disturbance was demonstrated to the patient and subsequently to his superior officers and clearly explained why someone who has a visual acuity of 20/15 during the day could be so nearly blind at night when he shifts over to a rod-predominant system. As a result, the patient's military career was no longer in jeopardy, however, he was moved to a more academic/administrative role training individuals on land during the daylight hours, which was well suited to his condition.

CASE #2

The second case follows along the same sequence, except this patient was 30 to 40 years older than the patient from Case #1. The patient described only what he could explain as "huge blind spots" in his center vision that started years ago when he noted his color vision starting to fade. He went through hospitals in New York, the Midwest and throughout the rest of the country until he finally landed in Hawaii. With his clinical pattern degeneration, I scanned him using SD-OCT technology and was able to clearly enlarge the images on our 38-inch monitors and show the scans to the patient (Figure 2). His outer segments were disturbed and were clinically concentrated in the macula. After plotting the attenuated areas on the 3-D scan the patient, for the first time in over 30 years, was able to literally see what had been disturbing him for the last three decades. This is clearly shown on the scan as a number of "missing photoreceptor outer-segments." The little black dots (arrow), or void areas are where the cones outer segments should be. For the first time in his life he and his wife were able to visualize the "villain" that stole his driving and color vision.

SUMMARY

Today, we are using imaging to accurately pinpoint a diagnosis. Although there is no definitive treatment for these two cases, we are now clinically able to visualize alterations at the cellular level. Multimodality imaging enables the clinician to combine information from up to six different modes. We are now able to detect and assess subtle, subclinical changes that might alter or treatment decisions. With the high-resolution imaging capabilities of the Spectralis, a patient/doctor relationship is able to mature from trust to a partnership because the patient can be shown things that they would otherwise would have been quite difficult to explain with words alone. With SD-OCT technology, a picture really is worth 1,000 words. ■

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