OCT in Today’s Optometric Practice:
Diagnosing/Managing Glaucoma

Part two of a three-part series on the important role of the CIRRUS HD-OCT and how it may ultimately allow practitioners to provide a higher standard of care to their patients.

In part one of this series, I mentioned the development of optical coherence tomography (OCT) as one of the most significant medical breakthroughs in all of eye care. Take, for instance, the CIRRUS HD-OCT by Carl Zeiss Meditec, which enables practitioners to visualize disease that is invisible to ophthalmoscopy and helps to diagnose disease earlier and more effectively. Because of its importance, a panel of highly respected optometrists gathered at this year’s SECO International meeting in Atlanta to discuss the use of OCT in the modern optometric practice.

Highlights from this discussion pertaining to the diagnosis and management of retinal disease were presented in part one, in which retina expert Diana L. Shechtman, OD, provided a great deal of valuable insight. Here, in part two, we look at the use of spectral-domain optical coherence tomography (SD-OCT) in glaucoma. For this topic, we turn to the expertise of I. Ben Gaddie, OD.

Mark T. Dunbar, OD: Based on my conversations with colleagues over the years, it seems that most primary care optometric physicians purchase an OCT mainly for diagnosing and managing glaucoma, with retinal applications being a secondary reason.

How has spectral-domain OCT (SD-OCT), specifically with the CIRRUS HD-OCT (Carl Zeiss Meditec), changed how you manage and treat this disease?

THE EVOLUTION OF CIRRUS

I. Ben Gaddie, OD: OCT really has evolved. When dealing with glaucoma or glaucoma suspect patients, you really should get an OCT of the retinal nerve fiber layer (RNFL) and visual field (VF). The RNFL may appear normal by the normative database or visual inspection, but then when we look at the nerve with OCT, we can see glaucoma.

I look for some congruence between optic nerve findings, RNFL findings and my functional test of VFs. In the best-case scenario, the RNFL and the optic nerve are both damaged and the field is normal.

The ideal outcome in glaucoma is using the CIRRUS HD-OCT nerve fiber findings in conjunction with other risk factors to make the diagnosis and treat it before the patient develops a VF defect. With the CIRRUS HD-OCT, we can view the ganglion cell analysis (GCA) and the RNFL/optic nerve head (ONH) parameters, all of which is helpful information.

Diana L. Shechtman, OD: Well put. Glaucoma consists of both structural and functional change, so looking at both the VF and the RNFL analysis, as well as the GCA, is extremely important in terms of evaluating and managing the patient.

Dr. Dunbar: I would like to address the evolution of the CIRRUS data cube of the optic nerve.

When the Stratus OCT (Carl Zeiss Meditec) came out, it placed a little circle around the optic nerve, and relied heavily on accurate circle placement. If the circle was skewed inferiorly, you could get an artificial area of thinning or thickening. This is not something we encounter with the CIRRUS HD-OCT, which provides a significant amount of information from the cube scan of the nerve. It’s a large area, and placement around the nerve is much less of an issue because it’s fairly automated.

Dr. Gaddie: You bring up a great point. Many RNFL imaging devices can give you artifactual measurements. An incorrectly placed

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"The ideal outcome in glaucoma is using the CIRRUS HD-OCT nerve fiber findings in conjunction with other risk factors to make the diagnosis and treat it before the patient develops a VF defect."
measurement circle can actually provide an artifactual false-positive of having good nerve fiber when it’s actually not, and vice versa.

The CIRRUS optic disc cube scan obviates some of those issues, as Dr. Dunbar described.

Dr. Dunbar: Traditionally, the triad in glaucoma has been pressure, the optic nerve and the VF. Would you put the CIRRUS HD-OCT RNFL/optic disc cube scan measurements on the same level as these three?

Dr. Gaddie: Absolutely. CIRRUS HD-OCT is a cornerstone measurement for me. You don’t always get congruency between the nerve fiber and the nerve in the VF, so I have found it helpful to be able to evaluate the ganglion cells in the macula. After all, it’s the ganglion cells’ axons that make up the RNFL. It’s really powerful to see a defect on the RNFL and a congruent macular defect. I use the CIRRUS GCA to validate my RNFL findings. If both are positive, then I have a high degree of confidence in my clinical diagnosis.

Guided Progression Analysis (GPA) with the CIRRUS HD-OCT is also great, especially when looking at the nerve fiber. Even if I see VF progression on the VF, sometimes I don’t see it on the nerve fiber and other times I see it in the nerve fiber but not in the field. Having both measures helps me visualize different patterns of progression.

Dr. Dunbar: With regard to diagnosing glaucoma before it shows up as a VF defect or detecting structural change before it becomes functional change, where do you think we are with that?

Dr. Gaddie: That’s a great question. I have no doubt about the sensitivity and specificity of the CIRRUS HD-OCT. Sometimes we become so accustomed to our own diagnostic criteria that it’s difficult to make a concrete diagnosis when the only thing that is deficient is the nerve fiber. Or, when the pressure is high and the nerve looks relatively normal and you do an RNFL/optic disc cube scan and see some diffuse dropout.) This is where an expert in glaucoma diagnosis and management shines. A lot depends on the location and characteristics of the RNFL deficit.

**STRUCTURE & FUNCTION**

Dr. Dunbar: A paper by Mederios and colleagues shows how RNFL defects progress1, and what struck me in this study was that roughly 33% of patients had progression of the RNFL before or at the same time anything showed up on VF analysis. So, which comes first: structure or function? The answer depends on the situation. Sometimes structure will change in the optic nerve first,
and sometimes function will change first in the VF. This fact highlights the importance of CIRRUS technology in detecting change before it shows up on a VF.

Dr. Shechtman: A key point here is that with glaucoma, we have time. We don’t necessarily need to change a regimen or start medications immediately. There’s time to re-evaluate progression and repeat abnormal findings. Using the CIRRUS HD-OCT, you can get a quantitative measurement to show progression over time.

Dr. Dunbar: Good point, Dr. Shechtman. Doug R. Anderson, MD, has a saying: Never make a decision based on one VF or one intraocular pressure (IOP) measurement. Sometimes we get caught up in the business of the day and the patient is sitting in our chair and we feel like we need to make a decision now. However, it’s always prudent to bring that patient back, whether to repeat a visual field or an IOP or even an OCT.

Kirk L. Smick, OD: I agree with everything that’s been said. We perform ONH/RNFL and GCA on every glaucoma patient. In my opinion, CIRRUS HD-OCT has evolved to a position where it’s not only equal with the three baseline tests we’ve always done, but it carries enough weight for me that I treat solely based on its findings.

Dr. Dunbar: I frequently see patients with normal pressures but a physiologically large cup. Because I worry that these patients may be glaucoma suspects, I photograph their nerves and use CIRRUS HD-OCT to view the RNFL. Even if their RNFLs are normal, I still consider bringing them back for a VF.

Dr. Smick: I do the same thing in this situation because it gives me peace of mind. Patients will never complain when you tell them their results are normal. I can’t imagine not using the CIRRUS HD-OCT in this scenario.

Dr. Gaddie: That’s why it’s prudent to do a VF. Sure, some patients are lousy field takers, and others refuse to take them altogether. I document this in their charts and follow them with OCT and photographs and keep an eye on their IOP.

Dr. Dunbar: In the past, we didn’t do macular cube scans for glaucoma. But now that we have GCA, we do, and we have learned that ganglion cell loss can appear before VF loss.

Dr. Gaddie: Even before the CIRRUS HD-OCT offered GCA, I would see congruence between the RNFL and a full-thickness macular scan. I don’t find GCA as diagnostic as I do a confirmatory check against the RNFL.

When I look at the GCA and it’s deficient but doesn’t look glaucomatous, I consider whether the patient has some other retinal problem. It’s important to look for what we call “red disease,” which is when the normative database flags something as being outside normal limits when really, for that particular patient, it’s not abnormal.

Dr. Dunbar: We’ll talk a bit more about GCA later, but let’s briefly discuss the role of normative databases.

THE VALUE OF NORMATIVE DATABASES

Dr. Dunbar: Not many SD-OCT technologies have an FDA-approved normative database. I would prefer to have an SD-OCT with a normative database than one without, and I think most clinicians would, too.

Dr. Gaddie, can you tell us more about the normative database?

Dr. Gaddie: The CIRRUS HD-OCT’s normative database is probably the highest level of validation that you’re going to find.

So a normative database is good to have and is useful in the vast majority of patients, but you can fall into a trap of thinking someone has damage because it’s lighting up red compared to the normative database when it’s actually not a problem. There’s a whole host of things that can give you false negatives and false positives, so you have to be cognizant of that.

Dr. Dunbar: I think you outlined that very nicely. The information from the CIRRUS cube and the recent advances in the CIRRUS software have become quite valuable, even outside the setting of a normative database. For example, we now have information about RNFL thickness, RNFL symmetry, cup-to-disc ratio, vertical cup, disc area, rim area and cup volume.

Dr. Gaddie: Elevated IOP is the number-one reason people get worked up for glaucoma. Number two is either large cupping or asymmetry. Large cupping is often associated with a large nerve, and asymmetry can be associated with different size nerves in the same individual. So by far, it’s the most common index that I look at.

I also look at the average RNFL thickness, which for a normal individual on the CIRRUS HD-OCT is probably between 100 µm and 107 µm, so I can detect any asymmetry between the right and left eye. Glaucoma is an asymmetric disease, so average RNFL thickness tells me a lot.

And I look at change over time in the optic nerve cup-to-disc ratio. The CIRRUS HD-OCT is incredibly sensitive when it comes to finding changes in the optic nerve. It goes well beyond the RNFL.

Dr. Dunbar: The CIRRUS HD-OCT lets us accurately look at the size of the cup, the average cup volume, superior rim and more, to one hundredth of a micron. That’s very powerful.

Dr. Gaddie, how might you utilize the CIRRUS HD-OCT in cases that fall outside the normative database?

Dr. Gaddie: I’m not looking for an abnormality on the initial scan; I’m looking for change over time. There will often be a VF defect associated with an anomalous nerve. We can also watch the patient’s optic nerve with...
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Structure and function: Combined report (HFA and CIRRUS) available exclusively with ZEISS FORUM.

Dr. Shechtman: I rely on it quite a bit, but Dr. Gaddie brought up a good point earlier. Oftentimes, we’re referred a case of glaucoma that has a concomitant macular finding, so we need to consider whether a patient’s changes in the GCA are associated with maculopathy or early glaucoma.

Dr. Dunbar: I recently saw a glaucoma suspect who is diabetic and had mild diabetic neuropathy, but his macula seemed normal. To my surprise, he had macular edema, which I found thanks to the macular cube scan and GCA.

Dr. Shechtman: Ganglion cell loss and macular thinning has been documented in patients with multiple sclerosis (MS). In fact, rapid thinning of the ganglion cell layer may signify active disease. Hence, the use of GCA may play a role in the management and evaluation of patients with MS. In addition, some of the future neuroprotective treatments for these patients may potentially rely on the evaluation of GCA.

Dr. Gaddie: If ganglion cell layer thinning continues, the patient probably has progressive or very aggressive form of MS, so GCA is a great tool here.

Dr. Dunbar: Agreed. We have definitely seen an evolution in glaucoma management. We now have SD-OCT to correlate the information we obtain from perimetry. The bottom line is that the CIRRUS HD-OCT has made it much easier for the clinician to manage glaucoma patients.

This concludes part two of our series on OCT. Thanks again to Drs. Gaddie, Shechtman and Smick for their valuable input. Watch for the final installment of this series, which covers practice management issues related to SD-OCT.

The doctors involved in this roundtable have all received compensation for their contributions to this article. The views expressed in this supplement are those of the doctors.

* CIRRUS HD-OCT is not FDA cleared for the diagnosis of multiple sclerosis.

Mark T. Dunbar, OD: One of my patients is a 66-year-old Hispanic male with a history of poorly controlled diabetes mellitus type 2 since 2000 and non-proliferative diabetic retinopathy OU since 2004. We noted some inferior temporal thinning OD. His visual acuity has always been 20/20 and in May 2010, he was diagnosed with primary open-angle glaucoma. At that time, I initiated treatment. Over the next four years, we encountered compliance issues, and as you would expect, he progressed. The visual field index and Guided Progression Analysis (GPA) confirmed this.

His OCT from June 2009 shows inferior and temporal thinning on the retinal nerve fiber layer scan. Compared with his OCT in 2013, you start to see some loss superior temporally as well. GPA gives you two baseline scans and then two preceding scans that we had done (one in January 2012 and one in February 2013). Because of this patient’s compliance issues, we performed more OCTs than we normally would to capture any progression. He lost 4 µm in the superior quadrant in that short period. I was surprised to see change superiorly; however, another look at the stereo photograph confirmed the thinning. This underscores the reliability and validity of the CIRRUS HD-OCT and the value of the GPA, as well as optic nerve photographs.

This patient probably needs surgery. Stereo disc photos continue to be the gold standard for documenting and following optic nerves over time; however, SD-OCT has quickly emerged as an important tool. Could the ON data provided by SD-OCT one day subplant stereo disc photography as a way to more accurately follow glaucoma and glaucoma suspects to determine change? For now, we must rely on all the tools at our disposal to follow these patients.