Meeting Notes From the 43rd Annual Meeting of the ARDS

This fourth and final installment of The Aspen Retinal Detachment Society (ARDS) Meeting Notes reviews talks delivered by K. Bailey Freund, MD, a clinical associate professor of ophthalmology at the New York University School of Medicine in New York; and Justis P. Ehlers, MD, a staff physician at the Cleveland Clinic Cole Eye Institute.

Advances in multimodal imaging arrive at a breakneck pace. Enter Dr. Freund, whose unique expertise in this field lends itself to imaging some of retina's most difficult—or in some cases, least observed—diseases. In his discussion on multimodal imaging in white dot syndromes, Dr. Freund outlines the benefits of using optical coherence tomography (OCT) and offers a pearl for identifying inflammatory choroidal neovascularization (CNV) lesions.

Intraoperative OCT sits on the horizon, but just how useful is this technology? Dr. Ehlers discusses two trials assessing the efficacy of this technology. Although improvements are needed before wholesale adoption can occur, Dr. Ehlers' contribution gives us a peek at the OR of the future.

The 44th Annual Meeting of the ARDS will take place from March 5 to March 9, 2016, in Snowmass, Colo. For information on the meeting, visit www.aspenretina.com.

—Timothy G. Murray, MD, MBA

Multimodal Imaging in White Dot Syndromes

K. Bailey Freund, MD

In a presentation on multimodal imaging, K. Bailey Freund, MD, focused on the white dot syndromes (multifocal choroiditis, punctate inner choroiditis, etc.). He discussed several cases and pointed out that eyes with these inflammatory entities can have a similar appearance to those with more typical myopic CNV and that multimodal imaging can help to distinguish the two conditions. He noted that inflammatory presentations are particularly seen in one certain demographic: young myopic women. "But it may be that patients who are highly myopic and develop CNV have some underlying susceptibility to inflammatory disease because clearly not every highly myopic eye develops CNV," he said.

Dr. Freund reviewed key imaging features that can help distinguish between myopic CNV and an inflammatory entity.

At a Glance

- Multimodal imaging can help differentiate inflammatory from more typical CNV.
- A thickened choroid is an indication of active inflammation.
- Sub-RPE deposits of inflammatory material show up as little bumps at the RPE level on OCT and reveal inflammatory activity that can progress to CNV.
- Hyperreflective spikes along Henle layer are indicative of an inflammatory form of CNV.

MULTIMODAL IMAGING

Optical Coherence Tomography

When multimodal imaging is performed in the setting of multifocal choroiditis, OCT can reveal a transient increase in choroidal thickness, Dr. Freund noted. "When the disease is active, the choroid is often thicker," he said. "So if I see something different in the outer retina, and I am unsure if it is a new lesion or just a problem with the eye-tracking, I look to see if the choroid is thickened. If I see an increase in choroidal thickness compared with the patient's baseline, I am much more confident that there

is active inflammation, and I am more likely to treat."

Another key feature on OCT that helps distinguish between myopic and inflammatory CNV is the presence of sub–retinal pigment epithelium (sub-RPE) deposits of inflammatory material "that show up as little bumps at the level of the RPE," he said.

Other features of multifocal choroiditis on OCT include disruption of the ellipsoid zone and interdigitation zone (EZ/IZ), which is an indication of an acute inflammation of the outer retina. Choroidal hyperreflectivity and fundus hyperautofluorescence corresponding to the outer retinal disruption during the acute stage of inflammation may improve when the outer retinal anatomy is restored.

According to Dr. Freund, during the active stage of these inflammatory entities, EZ disruption adjacent to a sub-RPE lesion indicates a relatively more mild inflammation. "When you have a full-blown occurrence, we tend to see sub-RPE deposition, and those little bumps can erode through the RPE; this is when you are at highest risk for developing CNV," he said. In these types of cases Dr. Freund says he is quick to administer an anti-VEGF agent because "even if it is not fully addressing the underlying inflammatory mechanism, you are likely going to help prevent the neovascularization, which is how these patients end up losing their vision."

Near Infrared

Near infrared imaging, as performed on the Spectralis OCT (Heidelberg), shows reduced near infrared reflectance in areas of EZ/IZ disruption, Dr. Freund said. "And when we have large areas of disruption of the outer retina, we see field loss, often in the peripapillary region, so we see enlargement of the blind spot," he added.

Fundus Autofluorescence

Fundus autofluorescence findings during the acute stage of inflammatory entities include hyperautofluorescence corresponding to areas of EZ/IZ disruption, and this may resolve when the outer retinal anatomy is restored, Dr. Freund said.

"When we use fundus autofluorescence imaging, we do not always think about the fact that there is an attenuation of the signal coming from the RPE due to photopigment in the photoreceptors," Dr. Freund remarked. "So if there is a reduction in the density of that photopigment because the photoreceptors are not working due to inflammation or because there is persistent bleaching of the photopigment, you are going to see an increase in fundus autofluorescence wherever you have that reduced pigment density."

Increased autofluorescence can also occur simply because pigment density has been reduced, he noted. Not all hyperautofluorescence is due to an increase in lipofuscin.

Video: Advances in Multimodal Imaging

THE PITCHFORK SIGN

Dr. Freund shared a pearl for identifying CNV lesions that are inflammatory in nature. When highly myopic eyes, particularly those with staphylomas and very thin choroids, develop CNV, it tends to stay in the subretinal space. In eyes with inflammatory CNV, by contrast, "We see these hyperreflective finger-like bands going up into the outer nuclear layer and sometimes following Henle fiber layer, and that seems to be a marker for an inflammatory process," he said. "I call the finding of hyperreflective spikes or points following Henle layer the pitchfork sign. I thought those spikes were something found in all types of CNV, but it is much more common in inflammatory CNV." These spikes can serve as a marker to help determine the presence of an inflammatory entity.[1]

1. Hoang QV, Cunningham ET Jr, Sorenson JA, Freund KB. The "pitchfork sign" a distinctive optical coherence tomography finding in inflammatory choroidal neovascularization. *Retina*. 2013;33(5):1049-1055.

What is the Role of Intraoperative OCT?

Justis P. Ehlers, MD

A presentation by Justis P. Ehlers, MD, addressed questions about intraoperative OCT: Does intraoperative OCT influence decisions in the OR? Does the technology offer seamless feedback to surgeons? What hurdles exist to widespread use of intraoperative OCT?

Dr. Ehlers detailed which aspects of intraoperative OCT challenge its use in the OR. Lack of system portability and microscope integration have historically

At a Glance

- Intraoperative OCT can improve surgeon confidence in the OR, and in some cases can influence surgeons' decisions.
- Two studies examining surgeon use of intraoperative OCT devices showed that surgeons sometimes continue or stop surgery based on imaging findings.
- Intraoperative OCT must be improved before widespread adoption of this new imaging modality can be expected.

prevented many surgeons from adopting the earliest generation of the technology, and the lack of compatibility with surgical instruments limited real-time visualization. And, as with most new technologies, cost concerns siphoned enthusiasm from some potential adopters who waited to see how the technology might improve.

Dr. Ehlers offered updates on each of those concerns.

Early intraoperative OCT systems were modified tabletop systems, which, after they were set up for the OR, became difficult to move from room to room. Taking a cue from handheld OCT devices, engineers have developed microscope-mounted platforms for portable handheld probes. These devices are controlled via footpedal, and have x, y, and z translation, which improves the learning curve for surgeons. These handheld devices allow users to gather images quickly, leading to useful clinical application.

To investigate how microscope-mounted intraoperative OCT devices affect surgeons' decisions in the OR, Dr. Ehlers and colleagues launched the PIONEER study, the 2-year results of which were recently published.[1] The PIONEER study included more than 750 eyes evenly divided between anterior and posterior segment surgeries, according to Dr. Ehlers. Surgeon questionnaires were used to gather data.

Surgeons operating on eyes requiring membrane peel were asked to use handheld intraoperative OCT devices after they completed peeling. Surgeons reported that, in approximately 15% of cases, the intraoperative imaging altered their behavior in the OR. Some surgeons saw additional membrane on OCT; others who suspected that some membrane remained on the retina found that peeling was complete. Intraoperative OCT put surgeons at ease, Dr. Ehlers reported: 40% of surgeons reported feeling more confident that membrane peel was complete following intraoperative OCT use.

Dr. Ehlers said that intraoperative OCT systems can now provide immediate feedback on surgeons' actions during surgery: that is, surgeons can now see in real time their instrument movements on intraoperative OCT. To better understand the dynamics of these integrated systems, Dr. Ehlers and colleagues launched the DISCOVER study. Using postsurgical surveys of multiple surgeons as in PIONEER, the researchers asked questions about the value of heads-up display, microscope integration, and ergonomics. The study is ongoing, but preliminary results show that surgeons responded similarly to how they did in PIONEER: OR decisions were influenced by heads-up display intraoperative OCT, and surgeons felt that intraoperative OCT provided valuable feedback.

Still, small instances of interference were reported, such as the need to reboot machinery or the loss of footpedal control. Surgeons reported contamination issues, such as touching the microscope in places where it should not be touched. Although these contamination issues never spread to field contamination, they should not be ruled out as a cause for concern, Dr. Ehlers said.

Whether these devices improve surgical outcomes remains to be seen, and nonrandomized, unmasked studies such as PIONEER and DISCOVER may be prone to bias. But, Dr. Ehlers said, as further developments in the fields of instrument refinement, novel materials, and improved integrative platforms come to market, the likelihood is high that surgeons will become more confident in the influence intraoperative OCT devices can have on patient outcomes. ■

1. Ehlers JP, Dupps WJ, Kaiser PK, et al. The prospective intraoperative and perioperative ophthalmic imaging with optical coherence tomography (PIONEER) study: 2 year results. *Am J. Ophthalmol*. 2014;158(5):999-1007.

Video: Advanced Intraoperative Management of Vitreomacular Traction