

Innovations in the Management of Ocular Surface Disease

A roundtable discussion on:

- Opportunities to Specialize
- The Role of Systemic Disease
- Diagnostic Tools for Dry Eye/MGD
- Treatment Tactics
- Clinical Cases

Faculty:

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(Moderator)

Douglas K. Devries, OD

Arthur Epstein, OD

David L. Kading, OD

Walter O. Whitley, OD, MBA

Faculty



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Group in Lexington, Ky. He is also *Review of Optometry's* chief clinical editor and vice president of Clinical Content.



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He also serves as its director of Clinical Research. Additionally, Dr. Epstein is chief medical editor of the widely read e-journal *Optometric Physician*.



David L. Kading, OD, practices at Specialty Dry Eye and Contact Lens Center, a referral-based anterior segment, dry eye and contact

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Dry eye affects nearly five million Americans—including 50% of all contact lens wearers^{1,2}—and as many as 20 million suffer from dry eye symptoms.³ Fortunately, there has been a recent explosion of new technologies to treat dry eye and ocular surface disease (OSD). For optometrists, the prevalence of these conditions, coupled with new instruments, tests and approaches, offer the opportunity to add a dry eye specialty to practice.

Recently, five OSD experts participated in a roundtable at an industry meeting to talk about the latest innovations and treatments available to help this growing—and often long-suffering—patient base. Their discussion was edited and condensed in the following pages to provide useful pearls and information to other eyecare professionals.

Paul Karpecki, OD: As dry eye specialists, we routinely hear from other doctors on the many challenges of treating dry eye patients. Dry eye is multifactorial, with causes ranging from age, gender, environment, medications, systemic disease, contact lens wear and ocular surgery. **Why should optometrists address the many challenges of managing ocular surface disease patients?**

Arthur Epstein, OD: Dry eye presents a massive opportunity. Over the last few years, we've seen incredible growth and interest in dry eye, which I think has mirrored the growing trend of an increase in the disease. Also, our understanding has exploded in recent years. Today, we understand meibomian gland dysfunction (MGD) and its role in dry eye. Optometry is uniquely poised as very patient-centric and ocular surface aware, and we should be the primary provider for OSD and dry eye care.

Dave Kading, OD: I agree. Optometry is the gatekeeper and we are at the front line of the disease. Optometrists look through slit lamps more often than any other profession, and that provides us the opportunity to diagnose and manage these patients.

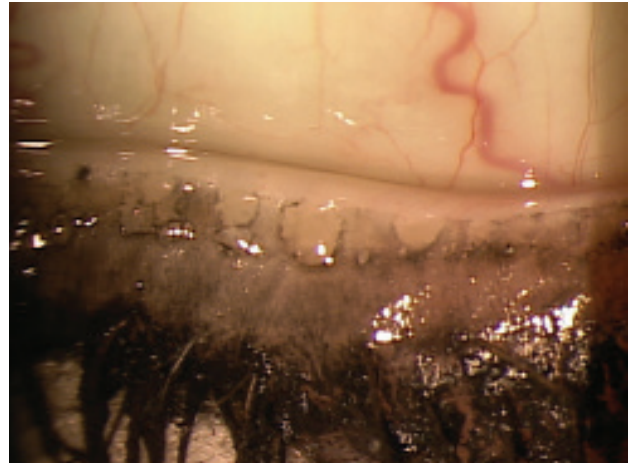
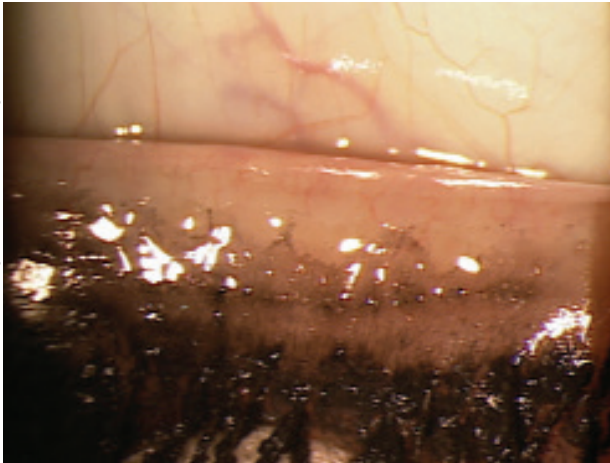
Doug Devries, OD: We all practice in almost a secondary dry eye type of clinic where we're seeing severe dry eyes and dry eyes that haven't responded to other treatments or that have just been ignored over the years. I think that with the prevalence of light-emitting devices and the amount of time young kids are spending on computers, we're seeing dry eye manifest even earlier. Primary care optometrists can detect dry eye at these earlier stages before the disease progresses and the long-suffering patients seek help in the advanced clinics where we practice.

Dr. Karpecki: If there is one condition that probably affects everything we do as an optometrist, it is likely to be OSD. People are coming in wanting the best possible vision, and it doesn't matter if it's contact lens-related dry eye or MGD. And that causes drop out. Their spectacles may seem like they're not working because of the OSD. Biometry can be miscalculated if they go into cataract surgery. **Do other opportunities exist for optometrists to pursue a specialty in ocular surface disease?**

OPPORTUNITIES TO SPECIALIZE

Dr. Devries: In terms of growing a medical practice, dry eye is the easiest area to enter into from both a technology and a cost standpoint, but not necessarily from a treatment standpoint. Dry eye tends to be one of the more complex conditions to treat, yet it offers tremendous practice management opportunities from testing to treatment. And ultimately, our patients will benefit.

Walt Whitley, OD: Dry eye is a progressive condition, so by the time



Pre (left) and post (right) meibomian gland expression in a 30-year-old white female.

many of these long-time suffering patients finally get to us, they've already tried several different artificial tears and all the different treatments, and they are coming to us so we can finally do something to help improve their symptoms, their vision and their lifestyle. Adding a dry eye specialty increases patient retention, word-of-mouth referrals and practice growth.

Dr. Kading: I see dry eye as the glaucoma of the anterior segment. If we wait until the patient develops symptoms, the disease may have advanced into a more moderate or severe stage, at which point reversal is difficult. Early detection is our best opportunity we have to help these patients. And the new technology currently available from our industry partners helps us to do that more effectively and at a much earlier state. The technology and recent innovations create incredible opportunities to help our patients and grow our practices, especially in the medical model.

Dr. Epstein: We now have amazing technology at our disposal. Who would have dreamt that we'd have a little Star Trek-like device for measuring osmolarity? I can now measure lipid layer thickness down to the nanometer level and actually quantify blink dynamics. With meibography, I can literally now show patients an X-ray-like image of their meibomian glands. The technology can convey a

sense of urgency when you start to see meibomian gland dropout that may be permanent. Quality technology elevates the whole practice and elevates us in the process. I see it as the future of the profession.

Dr. Kading: Contact lens wear poses another potential opportunity for dry eye. We know that up to 50% of soft contact lens patients complain of dryness⁴—and these are the successful contact lens-wearing patients. This trend has continued to occur for the last 20 years, despite the fact we have improved materials and solutions. We need to change our mindset and consider that these patients have dry eye instead of trying to change their lens every year due to discomfort.

Dr. Karpecki: We also know that about 16% of contact lens wearers drop out every year.⁵ If we can implement the new technology and knowledge about dry eye to keep patients in contact lenses for just five additional years, that could be as much as an additional \$1.5 billion (approximately) influx to optometry.⁶ Of course, the main benefit is not financial, but rather for patients to stay in their lenses, if that is their preferred choice. There are times when it is best to try a new lens or new solution, but you must couple it with the disease treatment.

Dr. Devries: Many contact lens patients will attempt to migrate to

refractive surgery after becoming frustrated by a decrease in comfort and/or wearing time with their lenses. Very often, we need to battle OSD that has been the underlying cause of their contact lens discomfort prior to even considering performing refractive surgery.

Dr. Kading: When we treat dry eye in MGD prior to cataract or other refractive surgeries, the outcomes tend to be better.

Dr. Karpecki: A study from TearLab shows that 17% of patients who had elevated osmolarity had at least a full diopter difference in their K readings, and that some were as many as three diopters off.⁷ There's no way those patients are going to achieve an accurate biometry or the correct intraocular lens (IOL) power.

Dr. Whitley: If we can take a look at those lids and the meibomian glands and address that earlier in the condition, we're going to keep these patients comfortable and seeing well.

Dr. Karpecki: Today, we have advanced technology that's making a tremendous difference in diagnosing OSD, but there's not just one test that's the gold standard, similar to glaucoma. For example, tonometry is analogous to osmolarity. In the past, we relied on corneal staining and central staining. Although that's valuable, it's a late indicator of the disease. Staining is similar to visual field testing, which is also a late indi-

cator of glaucoma damage. Your optic nerve head evaluation is in line with meibomian gland analysis and expression. And then OCT is analogous to meibography and lipid thickness, etc. I don't believe our colleagues need all this equipment to start treating dry eye, but I do feel technology has greatly helped our ability to diagnose this disease.

Dr. Kading: There is some inexpensive technology that can easily catapult us into diagnosing dry eye in entirely new ways. For example the Korb Meibomian Gland Evaluator (MGE, TearScience) looks at how much oil is coming out of the glands and is very effective.

Dr. Epstein: There's technology we already have, a fingertip, fluorescein strip and observation with a slit lamp that the OD who has an understanding of the disease can use to make a diagnosis. Maybe

they can't initiate effective treatment, but they can diagnose and refer. I think it's important to encourage everyone to be cognizant of dry eye and to get involved no matter what level they are with technology.

Dr. Whitley: We use the Standard Patient Evaluation of Eye Dryness (SPEED) questionnaire (TearScience) as well. It's quick and tells us the frequency or the severity of the condition. Then we utilize all of the different point-of-care tests.

Dr. Karpecki: Let's shift gears and look at systemic disease. The three most common systemic diseases associated with dry eye are: diabetes; thyroid disease; and rheumatoid arthritis (RA), but there are subsets, such as Sjögren's syndrome. **What roles do these systemic diseases play in dry eye?**

ROLE OF SYSTEMIC DISEASE IN DRY EYE

Dr. Devries: The role of systemic disease is extremely important. Take, for instance, a disease entity like diabetes. We know that 52% of diabetic patients have dry eye disease.⁸ It is important to identify those individuals during the course of our case history during their eye exam. If someone tests positive for Sjögren's according to the Sjögren™ (Nicox Inc.) diagnostic test, not only do I send them to a rheumatologist, but I also tell them we're going to treat their OSD very aggressively.

Dr. Epstein: We tend to underestimate the number of patients who present with systemic disease. In the past, I always asked about RA, but I would often overlook diabetes. It was part of the health history, but I'm certainly

CLINICAL CASE #1

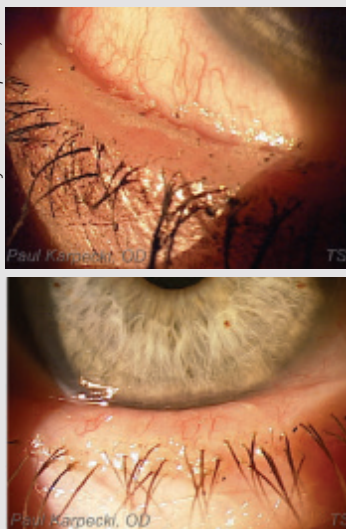
A 43-year-old Caucasian female with complaints of blurred vision, grittiness and burning eyes. She had a history of contact lens wear, but discontinued use two years ago due to frustration and the appearance (redness) of her eyes. She had poor nutritional habits (rarely eats vegetables and fruits; doesn't like fish) and was a previous smoker. No history of autoimmune disease. Medications: fexofenadine HCl (Allegra, Sanofi) q.d. for allergic rhinitis; VA: 20/20+ OU; SPEED questionnaire: 14/28; meibomian gland expression: turbid (+frothy lash margins); osmolarity: 308/317; NaFl staining: inferiorly.

Dr. Epstein: One test I would like to see is meibography. I get the sense that this patient suffers primarily from evaporative dry eye secondary to meibomian gland dysfunction (MGD). The frothy meibum and symptoms also suggest that she has *Staphylococcus* overpopulation with saponification due to lipase activity. This is consistent with her staining pattern.

Treatment would include a nutritional supplement to counter her poor diet; possibly doxycycline 50 mg b.i.d. initially; warm, moist heat goggles nightly; and I would add Avenova lid and lash cleanser morning and night to manage lid inflammation and bacterial overpopulation. I would also recommend either manual expression for short-term relief or preferably LipiFlow as a more definitive treatment depending on meibography results. Finally, I would supplement with a lipid-based drop such as Systane Balance.

Dr. Whitley: Questioning about allergy symptoms would be helpful in identifying whether this patient truly needs an oral anti-histamine such as fexofenadine and its associated drying effects. If she only experiences nasal symptoms, I would switch to an intranasal antihistamine, but if she needs a systemic allergy medication, I would switch her to oral montelukast sodium (Singulair, Merck) q.d., which would address her allergies with less ocular drying effects than antihistamines. I would also consider point-of-care allergy testing. It is important to look for signs of lagophthalmos when

Photos courtesy Paul M. Karpecki, OD



Patient's slit lamp exam findings.

inferior staining is noted. Any ocular surface exposure would need to be treated in addition to the other ocular surface disease (OSD) treatment. The following has become part of my dry eye protocol: baseline grading of lid telangiectasia; diagnostic meibomian gland expression (MGE); number of expressing glands; slit lamp meibography (we don't have a meibographer); and tear break-up time (TBUT).

Patient education is key in successfully managing dry eye patients. This particular patient suffered from OSD

for a few years both with and without contact lens use. I would make sure she understands that there is no quick fix and treatment will be somewhat of a process, but that we will work together to address her condition. Lid hygiene with commercial lid wipes q.h.s. and use of a Bruder Eye Hydrating Compress for five to 10 minutes would help decrease the bacterial load and soften/open up the meibomian glands. I would start her on some dry eye nutraceuticals such as HydroEye to address the signs and symptoms internally. Because there is obvious lid and conjunctival hyperemia, I would prescribe a topical steroid such as loteprednol etabonate ophthalmic suspension 0.5% (Lotemax, Bausch + Lomb) q.i.d., lipid-based tears b.i.d. and follow-up with her in one to two weeks. Lastly, I would discuss the root cause of her condition—MGD—and the best available treatment option, thermal pulsation, with which we've had great success. This would be considered at the follow-up visit.

much more cognizant of asking about diabetes today. Sjögren's syndrome has the greatest significance though, because we're seeing so much more of it in younger patients and those who are mildly symptomatic because of new testing methodologies. Now, you're able to test patients who have early dry eye, where you may have a bit of suspicion and you discover the dry eye is worse than you'd expected.

Dr. Whitley: We know dry eye and dry mouth are the early symptoms of Sjögren's syndrome, however, the disease can progress to affect the whole body. With appropriate lab tests such as Sjö, we can identify patients in the early stages of the condition and monitor them before it starts to affect them systemically. Delays in diagnosis can lead to more serious

complications of the lungs, kidneys and lymphoma. Also, when it comes to any of these systemic conditions, we must look at polypharmacy, because different medications contribute to dryness and can exacerbate it.

Dr. Kading: I believe most Sjögren's patients search for answers for about five years before they are even diagnosed. In reality, that's because they've already started to show symptoms. We need to start looking earlier in our dry eye protocols for Sjögren's. When we started testing for the disease, we discovered that 50% of our patients with dry eye were testing positive for Sjögren's—that's higher than the national average. This made me realize I needed to do this test much sooner and not think of Sjögren's as primarily affecting older females.

Case in point: I have a patient in her early 20s who tested positive for Sjögren's, and her early diagnosis will benefit her long-term life. We can change her life by referring her to the right rheumatologist and ordering the right treatment.

Dr. Karpecki: Let's turn now to MGD. Our understanding of this condition is one of the greatest advances that has helped us better manage patient who have dry eye disease. **What is the key to diagnosing MGD for a doctor who is just getting started in OSD management?**

PEARLS FOR DIAGNOSING MGD

Dr. Devries: The key is looking at and pressing on the meibomian glands. It's so simple and should be part of a routine slit lamp evaluation. If you're bringing a patient

Dr. Kading: In addition to knowing whether this patient's meibomian gland is turbid, I would like to know her actual MGE score. I would express her lids using a meibomian gland expressor and grade the level of oil coming out. I would also run a full workup looking at the TBUT and tear meniscus height. Lastly, I would suggest that we get a LipiView on the patient to understand her oil level and blink rate. We can assume inferior staining is due to bad tears, but it could also be due to a lack of blinking. I would also run a Sjö test to rule out Sjögren's syndrome and do meibography to understand the health of her glands.

Assuming that her glands are plugged on MGE (which I would expect), I would scrape her lids and perform LipiFlow on them to maximize their future gland flow. Then, I would advise her to take nutraceuticals and continue blinking exercises. I would follow up with her in eight weeks following LipiFlow to evaluate her oil production and blinking. From there, I would tailor any future treatments. If and when we get the oil production flowing as optimally as possible, I would then consider offering this patient occasional wear, single-use contact lenses.

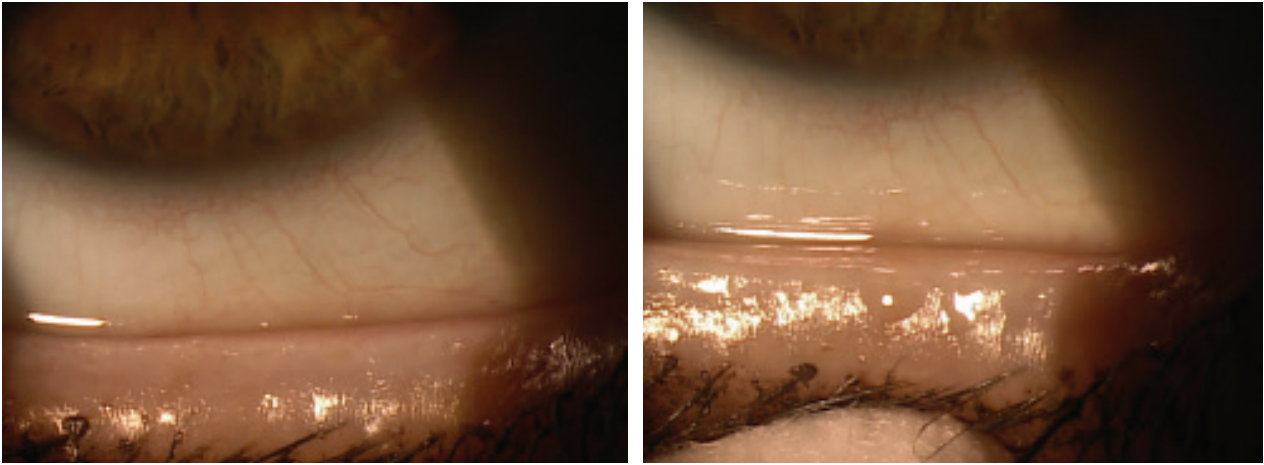
Dr. Devries: I would educate this patient as to the inflammatory cascade that has led to the level of MGD and OSD that is consistent to her inability to wear contact lenses. I would further explain the chronic condition that exists and the need for further testing, and I would recommend a LipiView evaluation take place to determine the completeness of her blink and thickness of her oil layer. Additionally, I would perform a complete meibomian gland evaluation with transillumination and lid debridement to help determine the duration of the lid therapy of warm compresses and lid hygiene and whether or not thermal pulsation of the meibomian glands would be necessary. I would also trial this patient on a topical anti-allergy drop in an attempt to eliminate the oral anti-histamine the patient was currently taking. Given the level of irritation of her lids, I would recommend a supplement such as HydroEye. An additional test would be the InflammADry to determine the MMP-9 levels and the possible need for cyclosporine and loteprednol.

Dr. Karpecki: Great job by the experts, as the patient's meibography

was taken and showed some stress of the glands including narrowing and truncation, but only to about three glands in each eye. Fortunately—and somewhat surprisingly—most were normal in appearance. Blink analysis showed significant issues with many partial or incomplete blinks. Transilluminating her upper eyelid while she closed her eyes to simulate sleeping revealed a noticeable gap in apposition or a non-tight seal of the eyelids. Her oral allergy medication was discontinued and she was switched to a nasal spray. As far as point-of-care testing, we noted the elevated osmolarity, but she also tested positive for inflammatory markers with InflammADry.

Given the elevated (though not extremely) osmolarity and turbid expression findings, she was placed on a specific lipid-based artificial tear (Soothe XP, Refresh Optive Advanced, Retaine or Systane Balance are all good choices). She was also started on HydroEye nutrition for dry eye and over-the-counter surfactant-based lid cleansers such as OcuSoft Lid Scrub Plus (SteriLid Eyelid Cleanser [TheraTears] would be another effective option in this category). The patient started the use of a commercial warm compress (Bruder Eye Hydrating Compress) daily for eight to 10 minutes. She was prescribed a combination agent, loteprednol etabonate 0.5% and tobramycin 0.3% ophthalmic suspension (Zylet, Bausch + Lomb) to use b.i.d. for two weeks before and after contact lens insertion/removal (tobramycin 0.3% and dexamethasone ophthalmic suspension 0.05% [Tobradex ST, Alcon] or tobramycin 0.3% and dexamethasone 0.1% [Tobradex] would be other options). She was also switched to a daily disposable contact lens and instructed on blink exercises. The patient was educated about thermal pulsation and mechanical debridement of the eyelid margins/biofilms with the BlephEx device as future options and that a Sjö test might need to be performed if no improvement was noted or other symptoms such as dry mouth were noted.

At six weeks, she noted remarkable improvement and was able to function again. She still was not back to full-day contact lens wear, but was pleased with the results. She is scheduled to return in another two months to consider the options discussed in follow-up therapy.



Pre (left) and post (right) meibomian gland expression in a 24-year-old white female.

back for a dry eye evaluation, a more extensive expression is needed to grade the meibum. In my years treating dry eye, the number of times I have seen patients who didn't have some kind of a MGD in conjunction with their dry eye has been very low and in these cases, the patient typically has been on a good supplement or has a good anti-inflammatory diet.

Dr. Epstein: If you had asked us to define MGD five years ago, we would have described it as a very visible, easily diagnosed condition. Now, we recognize that a significant percentage, maybe half of the patients, have no real visible signs. Without diagnostic expression, you're going to miss the early disease process. Not everyone with MGD has lid notching, telangiectatic vessels or extensive inflammation. Because we know MGD plays a role in the overwhelming majority of dry eye patients—close to 90%⁹—diagnostic expression should be part of every routine exam.

Dr. Kading: Meibomian gland expression gives us a known value for the pressure. I have manually expressed glands with firm pressure my entire career, but what does that tell me diagnostically? The glands are plugged, but how plugged are they? If we put a light amount of pressure on the eyelid and we don't see anything coming out, we know the glands are not producing oil when a patient

blinks. A gentle pressure is diagnostic for what's really happening with a blink. If we don't see anything come out with a gentle press, then that patient has MGD.

Dr. Whitley: We also have to take a look at the lids and lashes. There is a high association with anterior blepharitis, mixed blepharitis and demodex that have been associated with MGD. It's important to evaluate the lashes, lids and the meibomian glands altogether.

Dr. Karpecki: What is the key, then, to making a diagnosis?

Dr. Kading: If oil is coming out, I want to know what it is like. I want to grade it as either being extremely flowing like olive oil, or like Crisco or toothpaste. I also want to know whether the gland is obstructed altogether. I will also pull the eyelid back a bit and look at the meibomian gland as it goes into the eyelid. With that, you can see if there is any meibomian gland dropout and if a gland is plugged. You also evaluate the eyelid to see if there is any degradation in the smoothness. You can also use a transilluminator if you don't have a meibographer. These are simple things we can do at a baseline level with just our slit lamp and our finger by flipping the eyelid and examining it closely.

Dr. Karpecki: Traditional testing (e.g., staining, Schirmer's test, tear meniscus height, tear break-up time) is a good start, but in recent years, we've had tremendous

growth with new technologies and innovations in diagnosing and treating dry eye that are far superior in predicting the disease. Let's begin with osmolarity testing. **When should a practitioner utilize this test?**

OSMOLARITY TESTING

Dr. Devries: We utilize a SPEED questionnaire, and when patients reach six or above, we automatically turn to osmolarity testing. I rely on it heavily in terms of giving me a direction.

Dr. Whitley: Whenever we consider osmolarity, we're looking at whether the tears are stable and in homeostasis. If it's hyperosmolar, we know that can lead to more inflammation, and the inflammatory cascade can definitely take off. It's an objective test. It gives us a number, and it's something we can use whether it's mild, moderate or severe dryness. The number makes a difference for the patients. In our practice, we follow this number over time, just like we follow pressure in glaucoma. Once you have good control and have the tear film in homeostasis, the number is not going to fluctuate. One of the drawbacks that we've heard about with osmolarity is instability, but dry eye is very unstable; it's going to change between blinks.

Dr. Karpecki: There is absolutely zero variability in the test results when you don't have dry eye. That

is where I've found osmolarity testing to be incredibly valuable. If I have a patient with dryness and burning, grittiness and fatigue at the end of the day, and I measure their osmolarity at 284 Osm/L OD and 285 Osm/L OS, I'm not going to spend the next six months trying to treat them for dry eye. They have some other diagnosis such as asthenopia, vertical imbalances, convergence insufficiency, Salzmann's nodules, anterior blepharitis, allergic conjunctivitis or conjunctivochalasis in the early stages. Unfortunately, that patient has likely been treated for dry eye with every available therapy for many years. With this one test, we have consistency. When a patient develops dry eye and it progresses, that's when we see variability between the two eyes. But the numbers are typically well over 300 Osm/L and variable.

Dr. Devries: It's a given that there's going to be variability between eyes at times, but I'd like to see my treatment making the osmolarity value come in closer together between the eyes, resulting in a downward-moving average over time.

Dr. Karpecki: The key is the downward-moving average. Too many doctors will look at the number and say, "Okay, I've got a 335 Osm/L, and now I'm measuring again and it's 331 Osm/L (which is not a statistical change)." But the next visit it drops to 320 Osm/L, and you have to look at the movement because it's based on the body's ability to maintain homeostasis, as Dr. Whitley described earlier. The eye tries to maintain its level, and at times, you're going to have compensatory mechanisms between the two eyes. But when there is no disease and we get to a level under the low 300s, I found that four to six weeks later, their symptoms also disappear in some cases. When you get to the non-variable, less than 300 Osm/L level, we know the disease is being well controlled.

Dr. Kading: One of the benefits of following the number as it changes is it may not necessarily track to the patient's symptoms in the right order. So, as the number is improving, those patients' symptoms may not be improving at the same rate yet.

Dr. Whitley: Osmolarity testing is not just a screening tool for dry eye disease; it's also helpful for evaluating patients who are coming in for contact lenses, or those who are going to have cataract or refractive surgery. By identifying and treating patients with tear film instability, we can help maximize their contact lens success and surgical outcomes.

Dr. Devries: I think optometry in general needs to realize that if you have a contact lens practice, then you have a built-in dry eye practice that may be completely untapped at this point.

Dr. Karpecki: That was great insight into how osmolarity aids in diagnosis. **Tell me how osmolarity testing affects your management of dry eye disease.** What about the person who has a 340 Osm/L or 325 Osm/L osmolarity reading? Does a higher number with greater variability change your approach compared to a lower osmolarity number with less variability but is still above 305 Osm/L?

Dr. Whitley: Normally, when I have the higher numbers of moderate to more severe, I'm going to be more aggressive. I would use nutraceuticals such as HydroEye (ScienceBased Health), but I'd also use anti-inflammatories with both steroids and cyclosporin to get that number down as soon as possible. Once we bring the patient back and we see that number start to trend down, then I'll discontinue the steroid, but that would be after I have better control of the osmolarity.

Dr. Devries: I definitely react to the number—especially a higher number. Interestingly, when a number is high, there are often other signs. However, the patient

may be less symptomatic; they may be somewhat neurotrophic because of the progression. You can't always rely on symptoms. You certainly have to look at osmolarity, and I do. I get a lot more aggressive with treatment, and the patients seem to be comfortable with that because you've explained to them you have a lab test that put them into a moderate-to-severe range.

Dr. Karpecki: I've come to realize that the osmolarity number even dictates the type of artificial tear I use as part of the treatment. A high-osmolarity patient will often benefit from a drop that is more likely to lower osmolarity, such as Blink Tears Lubricating Eye Drops (AMO), TheraTears Lubricant Eye Drops (Akorn Inc.), FreshKote Lubricant Eye Drops (Focus Laboratories Inc.) or even Retaine MGD Lubricant Eye Drops (OcuSoft). A low osmolarity measurement in a patient with mild to moderate MGD seems to prefer Systane Balance Lubricant Eye Drops (Alcon), SootheXP Lubricant Eye Drops (Bausch + Lomb), Refresh Optive Advanced Lubricant Eye Drops (Allergan) or Retaine.

Now let's shift over into a discussion about meibography. **How important is this technique to the future of ocular disease diagnosis?**

MEIBOGRAPHY IN OCULAR DISEASE DIAGNOSIS

Dr. Epstein: I think it's critically important. The more a patient understands the disease, the more likely he is to follow through on therapies. Some patients require frequent visits, so you really want those patients on board. I can explain that dry eye disease is a progressive disorder, but if I can show that patient a picture, then all of a sudden my recommendations have that much more weight.

Dr. Kading: Meibography is a really good educational tool for showing a patient where they are. My meibographer has become one of my favorite instruments in

my dry eye for patient education, but it also educates me about the severity of the dry eye.

Dr. Karpecki: Before I used meibography, I had a patient who wasn't responding to any type of therapy. Finally, we got a meibographer and when I did the test, I found the patient had no meibomian glands. No wonder I could never get any expression! Through meibography, the situation changed from the patient wondering why I couldn't get him better and wanting a second opinion to saying, "Okay, I've got my answer. Let's do the best we can." It's one of my most valuable instruments. New technologies such as the LipiView (TearScience) are taking it to an even higher level. **Let's move into blink analysis and lipid layer thickness.**

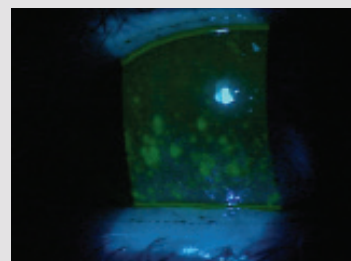
ALL ABOUT THE BLINK—AND LIPID LAYER THICKNESS

Dr. Epstein: This is one of my favorite topics. The blink is the weak link in meibomian gland production, which makes it the weak link in the dry eye equation. I have 20-year-old patients who have almost no functional meibomian glands. The blink is such a critical factor. What's nice about the LipiView is it allows you to actually assess the blink dynamic with the patient, review it, come up with a percentage of partial blinks and show the patient the image. That engages them in blink therapy. Blink exercise is also key. Most of the failures I've had in treating MGD have been with patients who have not been compliant with blink training.

Dr. Kading: I adamantly believe one of the best treatments we have for dry eye is complete blink and teaching our patients how to do it. These days, patients are on their computers and blink a lot less. Those glands will continue to become more plugged, and unless we get the underlying cause fixed, we are going to have meibomian gland loss and an increasing younger

CLINICAL CASE #2

A 54-year-old Caucasian female with a history of "severe dry eye" who was told by her referring doctor that she was the worst case of dry eye he had seen. Her main complaints were of dry eye with burning, blepharospasm and dry mouth. VA: 20/40 to 20/60 OU; SPEED questionnaire: 18/28; meibomian gland expression: paste-like and limited; osmolarity: 328/336; NaFl staining: see photo at right.



Patient's NaFl staining.

Photo courtesy Paul M. Karpecki, OD

Dr. Whitley: I would like to know what drops this patient is currently taking and how often she takes them. Also, what treatments has she already gone through? These answers would determine any additional treatments she may need.

I would suspect an autoimmune condition, such as Sjögren's syndrome, for this patient. Schirmer's testing would be beneficial to help her understand the affect the condition is having on her tear production and would justify the need for punctal occlusion, if it hasn't been done already.

Along with any treatments I prescribe, I would order the Sjö™ test for this patient. Although I already suspect Sjögren's syndrome, the test will allow the patient, her primary care doctor and me to understand the underlying cause of her condition. If positive, a referral to rheumatology would help with the appropriate treatment in addition to early diagnosis/detection of possible multi-organ involvement. I would also make a referral to her dentist for appropriate oral hygiene/care to address her dry mouth.

The best management for severe dry eye patients is being aggressive with treatment and management, which would include improving her meibomian glands. In addition to the essential lid hygiene, heat therapy and nutraceuticals, this patient would likely benefit from both topical steroids and topical cyclosporine. I would see her more frequently than our typical dry eye patient, monitor with tear osmolarity and adjust steroids as indicated. Once we address the inflammatory component, this patient would be an optimal candidate for thermal pulsation therapy to improve the meibomian and ocular surface, which are also contributing to her condition. Using a step-wise approach, I would add additional therapies as needed, including punctal plugs, oral pilocarpine and amniotic membranes to re-establish her ocular surface.

Dr. Devries: I would run a Sjö test for confirmation of Sjögren's syndrome and recommend this patient see a rheumatologist in addition to beginning a very aggressive treatment for severe ocular surface disease (OSD). The therapy would consist of: cyclosporine b.i.d.; loteprednol q.i.d.; a low-osmolarity, preservative-free tear q.2.h.; moisture goggles at night and during the day. If the patient was not on anticoagulants, I would additionally begin supplementation with HydroEye. On return visit, I would consider autologous serum and possibly amniotic membrane based on the level of continued punctate epithelial keratitis and/or filaments on the cornea. Counseling will be critical to this patient for her to maintain her required levels of therapy because she will most likely have or develop a neurotrophic cornea.

Dr. Epstein: This patient appears to be suffering from severe dry eye with systemic correlates suggesting Sjögren's syndrome, so I would order the Sjö test right away. With severe dry eye, we need to preserve whatever tears the patient has, so I am always looking for possible exposure from poor nighttime lid closure, which can be common, as well as evaporative dry eye due to meibomian gland dysfunction (MGD). I treat MGD aggressively in these cases.

demographic developing OSD.

Dr. Karpecki: Today, we have rampant use of light-emitting technology (tablets, smartphones, computers, etc.) that causes the stress that leads to partial or less frequent blinking and eventually results in damage. This was not the case 50 or 100 years ago. I will use an analogy from Jim Rynerson,

MD, who invented BlephEx (Rysurg LLC) and how MGD/OSD is similar to what dentistry might have been 150 years ago, when people didn't know to brush their teeth, so they lost them. People today don't know how to manage their meibomian glands, and so they're losing them. In dentistry, we now know to brush and floss daily. In optometry,

If the patient has not been on cyclosporine ophthalmic emulsion 0.05% (Restasis, Allergan) before, I will prescribe it, as it can be among the most successful scenarios for the drug. If they have been on it and failed, I don't re-initiate. The filaments may need to be manually removed and if the ocular surface can be managed, they may not recur. However, if they remain problematic, I would consider formulated acetylcysteine drops, which can break down the adherent mucous strands. For drops, I use a combination of a balanced tears such as TheraTears and Systane Balance at least q.i.d. Efficacy of drops can be quite variable, so I watch response closely and will trial other drops. Autologous serum is another possibility. With patients who continue to suffer despite aggressive therapy, I consider bandage contact lenses after discussing the risks and benefits with the patient. In some cases, scleral lenses can be quite helpful. One final note: Sjögren's is a systemic disorder, and the patient must be advised of this and a proper referral made for dental and rheumatologic care.

Dr. Kading: This patient sounds like a classic Sjögren's patients, so I would first order a Sjö test. I would then perform LipiView, meibomian gland expression and meibography to understand the health of her glands.

If I confirm the presence of filaments on the cornea, I would remove them. This patient is going to take three to six months to get under control, and I would educate her that we are going to approach things systematically. (If her Sjö test came back positive, I would begin co-managing with a rheumatologist.) I would use an amniotic membrane or bandage contact lens to help heal up the cornea and prescribe cyclosporin to treat the potential underlying Sjögren's, steroids and nutraceuticals. After one month, I would consider LipiFlow to begin to treat the underlying cause, then consider pulsed steroids and blink therapy. From there on out, I would evaluate treatment every three to six months because this patient has dry eye disease and will not be cured. Rather, we would only attempt to manage her symptoms.

Dr. Karpecki: Another great job by the expert panel. The patient's Sjö test was positive for Sjögren's syndrome and she was referred to a rheumatologist for systemic treatment. MGD was indeed advanced, as was the confluent corneal staining. She had tried so many artificial tears that she could name about every product available. We started her on topical corticosteroids (loteprednol gel) q.i.d. for two weeks then b.i.d. for two weeks as well as cyclosporine 0.05% b.i.d.

Given the degree of staining and the highly elevated osmolarity, she was started on FreshKote t.i.d. And since she had been using artificial tears more than six times per day, the preservative-free version would be recommended. Other preservative-free options for this level of osmolarity would include TheraTears or Blink or even Retaine. She received HydroEye and a Bruder Hydrating Compress and compounded acetylcysteine 10% t.i.d. for the filamentary keratitis. She returned at one month to assess pressures and overall status. The patient stated that she'd noted some improvement for the first time in years, but it was mainly in the morning and quickly progressed as the day went on. Because her cornea had not improved, the next option was either a ProKera Slim (Bio-Tissue) amniotic membrane or autologous serum. She elected the ProKera after discussing the two options as well as her insurance coverage. After five days, the ProKera was removed and the cornea and vision had improved significantly. Cyclosporine was continued long-term as was HydroEye preservative-free artificial tears and the Bruder mask. Corticosteroids were maintained twice a day for one more month.

She was seen for her six-month follow-up recently and vision has improved to 20/25 OU. She still has confluent staining but no filaments and no central staining. She has to use corticosteroids on a pulsed dosing regimen periodically (t.i.d. once a week about every three to four weeks). She was educated on risks and we will follow her quarterly to monitor pressures and ocular surface health. Future options, if she relapses, include another ProKera, given her success with it, autologous serum, oral doxycycline, a LipiFlow thermal pulsation treatment or another round of topical corticosteroids. If the filamentary keratitis were to return, we'd consider ProKera or a bandage contact lens.

patients should use commercial warm compresses and come in for LipiView and BlephEx treatments, just as a patient would go to the dentist for a cleaning. I see this as a tremendous area of growth for optometry.

Dr. Whitley: I agree with the blink. It's a huge part of meibomian gland treatment and educating

patients on proper blinking helps treat their condition. Additionally, by looking at the LipiView, we have a better understanding of the lipid layer thickness. Just because a patient has a higher number—between 60 or 100—does not mean he doesn't have MGD. It means he may have a milder form and there is often confusion with that.

Dr. Kading: There are some great studies indicating that low lipid layers, as viewed by the LipiView, correlate with low MGE scores.¹⁰ So, we know that if you have a low lipid layer, it's reflective of the amount of glands that are producing.

Dr. Karpecki: Let's discuss another new addition to the technology category, InflammDry (Rapid Pathogen Screening), that looks at matrix metalloproteinase-9 (MMP-9). **For those who have experience with InflammDry, how does this test work, how does it correlate and where does it fit into the testing paradigm?**

DETECTING MMP-9

Dr. Devries: I've had quite a bit of experience with InflammDry, and it has become an integral part of my diagnostic testing. For example, if a patient has six or greater on the SPEED questionnaire, they will get both the InflammDry test to look for elevation in the MMP-9s and the TearLab Osmolarity Test (TearLab Corp.) test to look at osmolarity. The tests approach diagnosis from two different directions. I've had zero pushback doing these tests in tandem because it gives more information. If we have dry eye, we have increased osmolarity, but if we don't yet have inflammation, I'll go into a specific treatment plan. The addition of these tests has helped guide my decisions in many instances.

Dr. Kading: We've used the test extensively as well. We had the diagnosis of dry eye being an inflammatory disease, an osmolarity disease and an aqueous disease, but now we have tests that can tell us "yes" or "no" in all the previously mentioned categories. That's where this test really comes in and how it is integral in telling us when a patient has no inflammation and therefore doesn't need a steroid, or that a patient has severe inflammation, so it's not the right time to do punctal plugs. The test guides us in

our treatment very eloquently. Plus, it is inexpensive, easy and quick.

Dr. Whitley: We also use the test to measure inflammatory levels in determining whether punctal plugs are the best course of treatment. We also do a lot of cataract and refractive surgery, and we found that the test helps us identify high levels of MMP-9 and gives us a call to action to treat prior to surgery.

Dr. Karpecki: *How do you determine which patients you should test for Sjögren's syndrome?*

TESTING FOR SJÖGREN'S SYNDROME

Dr. Whitley: I think that's something we're still figuring out. The test (Sjö™) has been out for about one year, and we are beginning to utilize it earlier within the treatment. One benefit is that we can let our chronic dry eye patients know there is something systemic going on that we can identify.

Dr. Devries: Right now, I use the test when things just don't make sense. For example, if I have a younger patient or even a middle-aged patient for whom things seem off in terms of how they're responding to treatment, it raises a red flag that there may be other autoimmune problems. Also, if a patient has any correlation with dry mouth in conjunction with the dry eye disease, I'll run the test.

Dr. Karpecki: We send all of our high-suspect patients to a lab for blood work. Because there are two sets of biomarkers that are analyzed with the Sjö test, there is a bit of a delay between receiving each set of results from the lab. You get the traditional biomarker test results first and that gives you some initial insight. Then you get the really sensitive information, the gland-specific, proprietary biomarkers, based on the lacrimal and salivary proteins a few days later. I like this because you're able to look at where the staging is, where the patient is, and I think it really helps us to get that Sjögren's

diagnosis much earlier and with greater accuracy than compared to previous testing methods.

There are also excellent treatments for Sjögren's syndrome available to us. I will refer out a patient who tests positive with the Sjö test to a rheumatologist to confirm the diagnosis and to begin treatment, if necessary. Cevimeline HCl (Evoxac, Daiichi-Sankyo) has been a wonderful drug for these patients. I've had patients who say it has allowed them to get back to their normal life because their dry mouth has improved and their eyes feel better. Studies also support this claim.^{11,12} Getting back to testing and other indicators for ordering a Sjö test, we also look at tear meniscus height, significantly elevated osmolarity and patients who have confluent corneal staining. And we all have those patients who bring their water bottle in and drink it throughout the exam or specifically check the box related to dry mouth on their intake form. There are many factors to look for, but the earlier we make the Sjögren's diagnosis, the better we can help our patients systemically and with their dry eye.

But next, why don't we talk about nutritional supplementation. **Why should an optometrist recommend an evidence-based supplement for dry eye therapy?**

THE IMPORTANCE OF NUTRITION

Dr. Kading: There is evidence that clearly shows that nutraceuticals can boost the overall quality of our patients' tears,¹³⁻¹⁵ so it's an incredibly good treatment and I think it needs to be a mainstay in many patient treatment protocols.

Dr. Epstein: We find that nutritional therapy, specifically HydroEye, has made a tremendous difference as a dry eye treatment. Nutraceuticals are an essential mainstay of therapy. I'm not going to have a successful patient who is not on a regimen.

Dr. Devries: When I see a pa-

tient who has dry eye and a good meibum, usually it's because he is taking a high omega-3 or omega-3 and gamma-linolenic acid (GLA) combination. This is something a patient can do holistically without getting any pushback from their other healthcare providers (unless the patient is on platelet therapy).

Dr. Whitley: There is confusion and lack of consistency in the market with respect to nutritional recommendations. Many providers recommend products that lack scientific merit. When deciding on what type of nutraceutical to recommend, we need to take a look at the literature. To date, seven controlled clinical studies on GLA, an anti-inflammatory omega fat, exist, showing benefit for a wide range of dry eye types, including post photorefractive keratectomy, contact lens, Sjögren's, MGD and postmenopausal women.

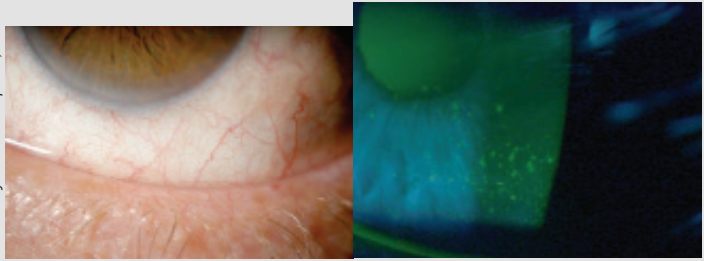
Our practice was involved in a six-month, randomized, prospective dry eye study that looked at inflammation in 38 postmenopausal women who were given a daily supplementation of HydroEye.¹⁵ We looked at their Ocular Surface Disease Index scores and early inflammatory mediators, the HLA-DR and CD11, and found an improvement in their ocular irritation symptoms. Additionally, there was a suppression of their ocular surface inflammation, and their corneal surface smoothness was maintained.

Dr. Karpecki: There is a lack of good quality scientific studies on dry eye nutritional supplements, so the research on HydroEye is very impressive.¹⁵ This was a level 1 study, meaning it's a prospective, randomized, placebo-controlled study, that showed statistically significant improvement in symptoms and key signs. That was one of the reasons I changed how I started incorporating it into my treatment regimen. I'm amazed at how well patients do on HydroEye and they say their lives have changed for the better because of it. I used to be a skeptic in the whole area of nutri-

CLINICAL CASE #3

A 39-year-old female referred by her co-worker was looking for a new prescription for distance. She says her eyes become gritty and sore at work, where she spends three to five hours on a computer each day. Secondary complaints include foreign body sensation, but only at work and late in the day. Patient has been a smoker for roughly 20 years, smoking a pack a day. She also reports drinking three to four cups of coffee in the morning, followed by diet cola the rest of the day. Her computer is located near both a ceiling fan and a desk fan. She eats little to no fish. SPEED questionnaire: 8/28; meibomian gland expression: turbid to paste-like in about 50% of the lower eyelid glands and no expression in the others; osmolarity: 298/310; NaFI staining: see images above.

Photos courtesy Paul M. Karpecki, OD



Glands and NaFI staining of patient complaining of gritty-feeling eyes.

Dr. Devries: Counseling on caffeine intake and lifestyle will be helpful, but usually meets with low compliance. Ergonomic counseling on height of computer monitor (if higher than eye level) and elimination of ceiling fan use would be of immediate benefit. Performing LipiView would give valuable insight to lipid level thickness and frequency of partial blinking, along with a complete meibomian gland evaluation including lid debridement. Given her age and the consistency of her gland expression, a transillumination of the meibomian glands would also help to determine whether a thermal pulsation treatment (LipiFlow) would be a benefit. At the very least, blink muscle memory conditioning and warm compresses would be of continued benefit. I would perform InflammDry to determine whether inflammation is elevated and anti-inflammatory therapy of cyclosporine is indicated. Due to the delta of 12 in the osmolarity, I would initiate treatment with a low-osmolarity tear and continue to monitor the osmolarity with TearLab.

Dr. Kading: For this patient, I would perform meibomian gland expression, LipiView and meibography to understand the health of her glands.

I would manage her by educating her on lifestyle and environment changes that would benefit her, recommend nutraceuticals and increased water intake, as well as LipiFlow and intense blink therapy.

Dr. Epstein: Meibomian gland imaging would be most helpful, as we are seeing meibomian gland dysfunction (MGD) in a younger population than ever before. In fact, this patient is already past the median age for our MGD patient population. The diagnosis would likely be MGD due to excessive close work and poor blink habits with evaporative dry eye. The staining is due to an unstable tear film, which goes hand in hand with the diagnosis.

First, the patient needs to understand that this will not be getting better on its own and will likely get much worse over time. Often, we see meibomian gland loss in these patients, which helps make the case. I would advise environmental changes, such as getting rid of the fan, adding regular blink exercises, a nutritional supplement and Avenova, which I describe as being akin to brushing your teeth morning and night. Depending on meibomian gland imaging, I would likely recommend warm moist heat and gland expression, preferably using LipiFlow.

Dr. Whitley: Looking at the initial findings, this patient's main issue is MGD. I would start her on lipid-based tears b.i.d., HydroEye as directed,

topical azithromycin q.h.s. and heat therapy q.h.s. I would re-appoint this patient for additional dry eye testing including meibomian gland evaluation, LipiView interferometry, tear film break-up time and tear osmolarity. This will allow both the patient and me to evaluate her lipid layer thickness and her blink rate. Depending on her results, treatment of her meibomian gland with thermal pulsation would be the most effective treatment.

It's important to educate our patient on both her ocular signs and her visual symptoms. Although the main reason for the visit is for glasses, a new glasses prescription would be inaccurate due to her poor tear film and improving the tear film should be our top priority. Once we improve the surface, we can get her a new glasses prescription—and improve her symptomatology. We are all judged by the quality of vision for our patients and ocular comfort and tear film stability is key.

Moreover, addressing the work/lifestyle modifications will help improve her condition. Being on the computer, the multiple fans, smoking and diet are all contributing factors to her condition. Blinking more frequently and utilizing prescribed therapy, whether over the counter or prescription will help improve her comfort. The patient has to understand the role that she plays in her treatment.

Dr. Karpecki: Meibography showed a significant area of dropout as well as various truncated glands; a surprising level of meibomian gland damage for a young patient. The patient's blink analysis showed a minimal blink rate, incomplete blink and was consistent with the inferior staining pattern noted. Environmental changes were discussed including increased water intake, removing all fans, lowering the monitor to below eye level, smoking cessation, etc.

She was placed on a lipid-enhanced tear (Retaine, Systane Balance, Refresh Optive Advanced or SootheXP) and HydroEye nutrition. She purchased a Bruder Hydrating Compress. Given her age, we avoided oral doxycycline and instead used topical azithromycin ophthalmic solution 1% (AzaSite, Akorn) q.h.s. She underwent a thermal pulsation treatment (i.e. LipiFlow) six weeks later and was educated that she would likely progress if we don't take an aggressive approach. She also had a BlephEx treatment for anterior blepharitis, which was noted, and the meibomian gland orifice areas was cleaned. At six months, she had quit smoking and taken on a somewhat healthier lifestyle, although she says she hasn't been drinking water like she should. She seems very compliant with the warm compresses and the blink exercises and is showing improvement in staining and meibomian gland expression. The patient is pleased, although she knows it can take 12 months to get to a significant improvement level. Osmolarity improved to under 300 Osm/L after the thermal pulsation treatment and that gave her further encouragement to continue.

tion for dry eye, but now I'm probably one of its biggest advocates.

Dr. Devries: I was the same way. There was so much confusion

within the market that you didn't know what to do. Evidence-based medicine really convinced me to go in that direction and we now

have some good science behind nutrition, so I feel much more comfortable and have integrated it into my practice.

Dr. Karpecki: Let's discuss GLA, another omega fatty acid, and its role in dry eye. While GLA is an omega-6 fat, it is important to differentiate between it and the unhealthy omega-6s we get from our diet. GLA is a unique omega-6 that encourages the formation of the prostaglandin PGE1 in the body, which explains why it has been well-established in research to deliver a number of health benefits, including reducing inflammation. Certainly GLA is an important ingredient in HydroEye that is also balanced by a careful amount of fish oil to enhance the formula's anti-inflammatory properties and other nutrient components. When

GLA will be for dry eye what lutein is for macular degeneration. Ten years ago, we heard a lot about lutein, and we knew it was important. Now, we would never consider a supplement without it. I think it will be the same for GLA and dry eye. Looking at all the studies that are now out, **has research been a factor for nutritional supplementation to be added to your treatment protocol?**

Dr. Devries: Absolutely. This type of research is what has really driven my decisions in recommending HydroEye.

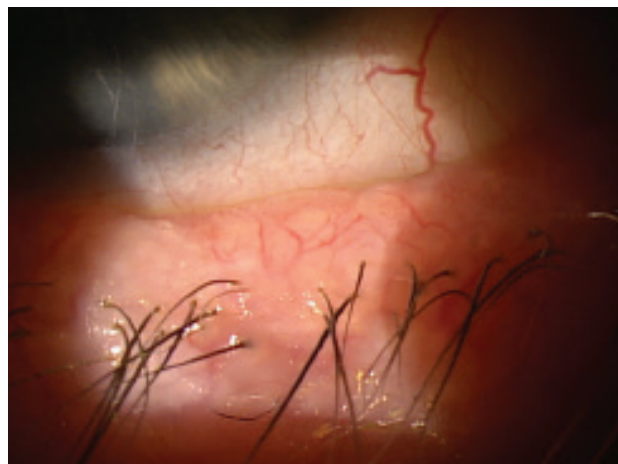
Dr. Karpecki: One important issue to mention is that GLA is not obtained from diet. It's not

dry eye. Even when I start cyclosporine and/or steroids, I recommend nutritional supplements.

Dr. Epstein: I think many of us have shied away from nutritional approaches because we think patients aren't going to buy into it. But they're much more open-minded than we think.

Dr. Karpecki: I've actually gone as far as to copy the first page of the HydroEye study. I know it may be confusing for a patient, but I want them to know that this is one of the most top researched products on the market to help them and it seems work. Keeping with the GLA discussion, **are there any contraindications to the use of the**

Photos courtesy Walter O. Whitley, OD, MBA



Evidence of rosacea and gland dropout in a 68-year-old male patient.

I was trying to decide if I should incorporate nutrition into my practice, I was fascinated that there were more OSD-related studies on GLA than there were on eicosapentaenoic acid (EPA)/docosahexaenoic acid (DHA) from fish oil or alpha-linolenic acid (ALA) from flaxseed oil. The first thing that intrigued me was there were several solid level-1 and level-2 type studies with valid power number. The studies ranged from Sjögren's success to post-photorefractive keratectomy to perimenopausal women with dry eye.¹⁶⁻²² I think the most powerful study is on HydroEye because of the timing and the way it was designed. Based on what I know today, I believe

found in fish or flax, so we have to supplement to make a difference. That said, when do you introduce nutritional supplements in your practice? Do you wait until the dry eye is severe, or do you recommend it at an earlier stage of treatment?

Dr. Epstein: For me, it's first-line treatment. I incorporate a nutraceutical, NovaBay's Avenova eyelid cleanser, and then create a plan for most patients who have MGD, which is the majority of patients.

Dr. Devries: I start it as a first line as well. I tell patients that it's something they can take in supplemental form that will help reduce inflammation throughout their body and also improve their

nutraceutical agents such as fish oil with GLA-type products?

Dr. Devries: You have to be careful with patients who are on any type of anticoagulant or antiplatelet therapy and make sure the healthcare provider involved is aware and has no issues with starting the nutritional therapy.

Dr. Whitley: It's all about collaborative care and working with the patient's primary care doctor. Just as Dr. Devries mentioned, if a patient is taking high levels of omegas and is also on a blood thinner, we can communicate with his doctor to ensure he is taking the proper amounts to minimize their affect on bleeding times and platelet counts.

Dr. Karpecki: *Are there any other benefits to involving nutrition in your practice besides the most important one of helping our patients with this disease?*

Dr. Epstein: I think it's a strategy to improve overall health. There are also revenue factors to take into account. After all, a successful practice is one that is financially successful as well. We now carry nutritional products in our office and it helps our bottom line.

Dr. Karpecki: I do as well, and it's a great service. Patients appreciate the convenience and our knowledge in this area.

Dr. Devries: We sell all of the products directly to the patient from our office. One of the benefits we found is that compliance skyrockets when you can actually put the appropriate treatment in the patient's hand.

Dr. Karpecki: Let's switch gears now and talk about thermal pulsation treatments such as LipiFlow (TearScience). There are certain patients who are motivated to have the treatment right away and do extremely well. I have others who prefer a more conservative approach and will move to the pulsation treatments after we have tried more conventional treatment options first. Traditional treatments such as rice in a sock and warm washcloths don't work very well because you can't maintain heat long enough and it's difficult to try to keep a washcloth on your eyes for five to 10 minutes in the shower.

The Bruder Eye Hydrating Compress (Bruder) has really helped us in this area, and the new thermal pulsation treatment is an amazing technology that I believe will be an essential treatment option for our patients.

Dr. Epstein: The traditional warm compresses don't work. They never did. I must have prescribed them to 10,000 patients and I had 9,999 failures. The reason why it doesn't work is they cool off too quickly. The patient is essentially putting lukewarm

water on an eyelid where the heat doesn't transfer to the meibomian glands at all. Masks and goggles that apply warm, moist heat do help somewhat, but heat alone is not sufficient—nor is manual expression that effective.

Bottom line, thermal pulsation has been a disruptive breakthrough in terms of patient management and I've had close to a 90% success rate with it. For many patients, it's been life-changing.

Dr. Kading: Warm compresses have the potential to actually work if a patient will leave something that is 108° on their eyes for more than 10 minutes twice a day. So it can be successful if done correctly, but 99.99% of patients won't. Even with the masks, if they are not leaving it on long enough, it won't work. With pressure, we can get meibum to come out of the glands when it's hardened, but you have to exert at least 10 psi to do that, and a good 70% of patients could not handle the pain of that much pressure.²³ LipiFlow is much more successful. I think the reason LipiFlow does not have a 100% success in everybody's office is because they're basing the success on what the patient is going to feel. In MGD, we're trying to get the patient's glands to flow better so they don't die and cause the patient's symptoms to worsen. The benefit of LipiFlow is not just to make people feel better in the short-term, but to make sure they don't feel worse a year from now.

Dr. Whitley: Setting expectations for the patient is definitely going to be the key depending on the level of the severity of their condition. This is actually a life-changer for many of our patients. Within our practice, we have 94% patient satisfaction with the LipiFlow within a month. We have about 50% improvement within the SPEED scores in the subjective and frequency of their condition, which is sustained after six months.

As an example, take the very frustrated, unhappy dry eye pa-

tient who had significant MGD. He was on every single prescription drop available, and we did the LipiFlow on him. When he came back, I asked how his eyes were and responded, "Incredible. This is the best thing that ever was done." So, the frustrated patient who's not very happy was very excited about this technology. There is no way I could do what that instrument does manually because of the uniform heat and pressure.

Dr. Epstein: In terms of convenience and overall comfort, we can't even come close to what the LipiFlow does with older technology. Most patients come out saying they had a spa-like experience.

Dr. Kading: Primary care optometrists who don't have a LipiFlow machine should get in the habit of referring out to an optometrist who specializes in dry eye and does have the technology. You then follow-up with the patient and do the workup after the procedure.

Dr. Karpecki: *How do you choose the best patients for the LipiFlow treatment?* Is it something you recommend to all patients? If not, how do you find the ideal patient for this treatment?

WHEN TO LIPIFLOW

Dr. Devries: I recommend my dry eye patients with MGD undergo LipiView so we can get an analysis. We look at the blink, and then we'll go through that meibomian gland evaluation. At that point, if I feel that they're going to have any kind of reasonable outcome, I'll recommend the LipiFlow. But many times, I'm planting the seed for further down the road.

Dr. Epstein: If I diagnose MGD, I explain that LipiFlow is the definitive treatment. I tell them this is the treatment that has the highest chance of success, the greatest convenience and the longest effectiveness. We have longevity after treatment that should be at least a year and can be well beyond that. The alternatives are more frequent visits, less pleasant experiences and

less likelihood of success. I don't expect patients to say yes right away, although maybe 20% do. I find a lot of patients will come back after trying manual expression.

Dr. Whitley: The SPEED score also helps me figure out which patients may benefit. Although we see the signs, patients are rating their success on how they feel and that's where the SPEED score comes in, so it's important to take into consideration as well.

Dr. Karpecki: How often do you have to do the treatment?

Dr. Epstein: I tell patients that human beings are very variable, and there is no way of predicting exactly how long this will work. Experience tells us that a year is typical, in some cases longer. I've had conversations with colleagues who've had results up to three years. Not everybody is that lucky, but I think as we get better at managing these patients, the time between treatments will increase. At least, that's what I have been seeing.

Dr. Kading: Retreatment for me is based on how many glands a patient has going into treatment and

how well they blink after treatment.

Dr. Karpecki: What are the adjunctive therapies you still recommend in between the LipiFlow treatments? Obviously, nutrition plays a key role.

Dr. Epstein: I prescribe a lot of Systane Balance and I've been using Avenova eyelid cleanser, which inactivates lipase and decreases saponification that disrupts the lipid within the tear. I have had phenomenal results with the product.

Dr. Whitley: These patients do need a maintenance-type therapy, so whether it's nutraceuticals or drops, everybody's going to be different, but the main thing is to manage the patient.

Dr. Kading: Korb and Blackie showed incredible success with scraping the eyelids prior to and definitely continuing on following LipiFlow.²⁴ That treatment alone has shown incredible improvement in symptoms for patients and can't be minimized.

CONCLUSION

Dr. Karpecki: Today, optometrists are armed with technologies and treatments we've never had

before to help improve the lives of patients with OSD. We have point-of-care diagnostic tests like TearLab Osmolarity Testing, that provide critical information in less than five seconds to help make a proper and much more accurate diagnosis of dry eye disease and MGD when combined with slit lamp findings, corneal staining, blink analysis and meibomian gland expression. It becomes the glue or connector test that helps put all other findings together so our treatment protocols are more likely to succeed.

We now also have technology (Sjö™) that allows us to confirm the presence of Sjögren's syndrome, an underlying cause of dry eye in more than 10% of these patients,²⁵ sooner than traditional testing. This allows these patients to be systemically treated earlier to both avoid the severe systemic problems Sjögren's patients experience, but also aid in decreasing the inflammatory response that causes further lacrimal gland damage. We have other advanced diagnostic tests as well that include meibography (e.g., LipiView II) and

CLINICAL CASE #4

A 62-year-old male presented with "decreased or blurred vision, severe irritation, dryness, burning and stinging eyes." He was told he might have rosacea; redness and telangiectasia were noted on the nose and forehead. Patient is overweight and takes medications for hypertension and hyperlipidemia, as well as aspirin q.d. He has a relatively poor diet and because he was adopted, has no family history. SPEED questionnaire: 23/28; osmolarity: 324/333; meibomian gland expression: paste-like to minimal or no expression.

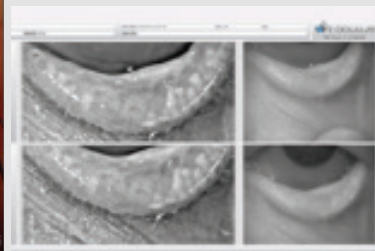
Dr. Epstein: This patient already has significant meibomian gland loss associated with what appears to be ocular rosacea, which can be rapidly progressive and requires treatment. I would put him on the following regimen:

- Doxycycline b.i.d. for one month, then q.d. and/or four tabs of HydroEye q.d.
- Avenova b.i.d.
- LipiFlow for his severe MGD Note: there is current debate regarding the ability of LipiFlow to recover gland loss vs. restore gland function. I believe we can regain at least some loss. In a case this severe, manual

expression is of minimal and very transient benefit compared to LipiFlow

- After treatment-reinforced blink exercises to keep the glands mobile (iPhone app available for free from TearScience), use of lipid-based drops such as Systane Balance or Refresh Optive Advanced.

Dr. Devries: This patient requires immediate and advanced treatment for the severe atrophy of the meibomian glands secondary to the rosacea. I would recommend doxycycline 50 mg b.i.d. and loteprednol q.i.d. for the lid inflammation. I would recommend LipiFlow in an attempt to preserve the remaining meibomian glands, and I would perform InflammDry to determine the level of inflammation and possibly start cyclosporine at a later visit. Furthermore, I would place the patient on a low-osmolarity preservative



Exam findings of 62-year-old male presenting with "decreased or blurred vision, severe irritation, dryness, burning and stinging eyes."

blink analysis. We have nutritional supplements such as HydroEye, with scientific studies to back their results that are having a significant positive impact on OSD and patient symptoms.

Finally, we have thermal pulsation treatment options that can speed up the treatment process or, in more severe cases, halt further progression of the disease. This approach may change how our profession manages dry eye so it will be more similar to that of a dental model, where patients are monitored for OSD health, use lid hygiene, nutrition, artificial tears or therapeutic agents and commercial warm compresses daily (like brushing, flossing or treatments for gingivitis) and see their doctor for in-office treatments such as thermal pulsation or cleaning of the eyelids and surface of the meibomian gland orifices (like the in-office dental cleaning procedures). This may allow our patients to stay in contact lenses longer, to have better biometry measurements when it's time for cataract surgery, better refractive surgery outcomes or to simply

prevent the damage and loss of quality of life associated with OSD such as dry eye. These innovations provide exciting opportunities to not only help our patients but to also grow our practices. ■

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tear q.4.h. and have his osmolarity monitored every visit. I would also place this patient on HydroEye, and if he had any history of dry mouth, I would also run a Sjögren test looking for Sjögren's syndrome.

Dr. Epstein: I would perform meibomian gland expression and LipiView on this patient before managing him with LipiFlow, blink exercises, nutraceuticals and doxycycline.

Dr. Whitley: Meibography and external slit lamp photography would be very impactful in this case. The patient has significant meibomian gland atrophy and will need to understand the basis of our treatment. We are trying to preserve the remaining meibomian gland and need to be aggressive in our treatment. Combination therapy (lid hygiene, heat masks, nutraceuticals and anti-inflammatories) will be important, however thermal pulsation will also be useful to optimize his functioning glands. We really need to drive home what a "successful outcome" would be, which would be making sure the patient doesn't get worse.

Patient education on the systemic factors that contribute to this patient's condition will help him better understand that there is an underlying cause. Oral doxycycline (50 mg b.i.d. for one month then q.d. for several months) would be an excellent treatment of choice. I would also ask the patient if he has seen a dermatologist previously and if not, I would recommend he see one to help address his condition.

Dr. Karpecki: Excellent suggestions. In fact, the patient was placed on oral doxycycline 50 mg b.i.d. for three months, then continued for another

three months q.d. He was then switched to HydroEye longer term and also underwent mechanical eyelid cleaning for the anterior blepharitis and MGD as well as thermal pulsation, knowing we had to do everything we could to maintain his remaining meibomian glands and the risk of further progression.

He maintained the Bruder mask, OcuSoft Lid Scrub Plus or SteriLid and blink exercises after thermal pulsation. He was prescribed Lotemax ung q.h.s. because of his severe morning symptoms; that seemed to help him feel a little better in the morning. He was started on an osmolarity-lowering artificial tear (Blink, TheraTears or FreshKote) and then a lipid-based tear (Retaine PF was recommended).

At the six-month visit, the patient stated that his burning and stinging had improved. Osmolarity was 314 Osm/L /327 Osm/L, so he still has a long way to go to reach symptomatic improvement. Meibomian gland expression showed mild improvement in the consistency of the meibum. The missing glands of course would not return. He fully understands that this is a long-term scenario and that we are working to keep him from getting worse as opposed to expecting he can return to a state where he once had the presence of healthy and functioning meibomian glands. He still has trouble with reading and computer work and has to use artificial tears or take breaks. We've monitored his pressures as he continues to require steroid ung q.h.s. and he was educated on the risks. The patient was actually very pleased with the results and his care, so it was a great example of setting the proper expectations because full resolution is not likely to occur.

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