Examining meibomian gland dysfunction and its impact

As ophthalmologists observe the impact of meibomian gland dysfunction (MGD) in clinical practice, understanding of the condition continues to advance. MGD is the number one secondary complaint in about 40–50% of our patients. It is either a primary or a secondary complaint in about 40–50% of our patients.”

**Defining MGD**

“The International Workshop on Meibomian Gland Dysfunction described MGD as a chronic, diffuse abnormality of the meibomian glands commonly characterized by terminal duct obstruction and/or qualitative, quantitative changes in the glandular secretions,” Dr. Donnenfeld said. “It may result in alterations of the tear film, symptoms of eye irritation, clinically apparent inflammation, and ocular surface disease (OSD).”

Respondents to the 2016 ASCRS Clinical Survey indicated that 48% of dry eye patients have MGD. Estimates by the Meibography Summit participants were considerably higher, with approximately 88% thinking that the prevalence of MGD is increasing. Fifty-six percent of Meibography Summit participants reported that 60–75% of their cataract surgery candidates have MGD, and 82% reported that more than 75% of their OSD patients have MGD (Figures 1 and 2).

However, some suspect increased awareness accounts for the increase. “If you look at Michael Lemp’s publications on the prevalence of MGD, we know it increases with age and we know this is the most common cause of dry eye disease,” said Terry Kim, MD. However, he thinks MGD is still underdiagnosed because many clinicians are not looking for it.

Others contend that additional factors are at work. “There are few sources for it, but modern risk factors are very real,” said Elizabeth Yeu, MD. Many people use digital devices more than 5 hours a day, she said, leading to decreased and incomplete blinking.

“When people blink, normally the lower eyelid moves medially, and that is a cleaning mechanism. It is a pumping mechanism for the oil glands, too,” said Paul Karpecki, OD. Patel et al. showed that people blink 4.5 times when using video display devices compared with 18 times in other situations. “So they are not getting that cleaning or meibomian gland expression,” he said.

Preeya Gupta, MD, and her colleagues reported that 42% of children ages 4–17 had gland atrophy. “There were children who even had moderate to severe meibomian gland atrophy, and all these children were asymptomatic. The key for us as clinicians is to try to figure out when these patients are going to become symptomatic.

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**Faculty**

- **Moderator:** Eric Donnenfeld, MD, practices with Ophthalmic Consultants of Long Island and Connecticut, and is clinical professor of ophthalmology, New York University, and trustee, Dartmouth Medical School.
- **Frank Bowden, III, MD:** is founder of Bowden Eye Associates, Jacksonville, Florida.
- **Alan Carlson, MD:** is professor, Department of Ophthalmology, Duke University School of Medicine, Durham, North Carolina.
- **Douglas Devries, OD:** is co-founder, Eye Care Consultants of Nevada, adjunct clinical professor of optometry and residency director, Pacific University College of Optometry.
- **Edward Holland, MD:** is professor of ophthalmology, University of Cincinnati.
- **Alice Epitropoulos, MD:** is clinical assistant professor, Ohio State University Wexner Medical Center, Columbus, and partner, Ophthalmic Surgeons & Consultants of Ohio.
- **Paul Karpecki, OD:** is director of cornea services, Advanced Ocular Surface Disease Center and Research, Kentucky Eye Institute, Lexington, Kentucky, and practices in the ocular surface disease clinic, Gaddie Eye Centers, Louisville, Kentucky.
- **John Sheppard, MD:** is professor of ophthalmology, microbiology and molecular biology, Eastern Virginia Medical School, medical director, Lions Eye Bank of Eastern Virginia, and president, Virginia Eye Consultants, Norfolk, Virginia.

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EyeWorld recently gathered 17 experts on ocular surface disease at a special summit to discuss the current thinking on meibography and meibomian gland dysfunction. The Meibography Summit focused on the role of meibography as a diagnostic tool, as well as how to best to integrate diagnostic findings into treatment paradigms in clinical practice. Summit participants were asked to try to achieve consensus on a number of key questions. Their responses are featured in graphic form throughout this supplement.

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William Trattler, MD, is in practice at the Center for Excellence in Eye Care, Miami.

Elizabeth Yeu, MD, is assistant professor of ophthalmology, Eastern Virginia Medical School, and in private practice, Norfolk, Virginia.
and catch them before that,” Dr. Gupta said. Kim et al. showed that 82% of patients using glaucoma medications had MGD, and Mocan et al. reported that obstructive MGD was seen in approximately 96% of topical prostaglandin analog users.\

Cochener et al. stated that 52% of patients having cataract surgery had MGD and 56% had gland atrophy. Trattler et al. found that approximately 77% of patients having cataract surgery had fluorescein staining.

### Early intervention

Early diagnosis and treatment are critical. Otherwise, patients have a chronic condition that leads to OSD and vision problems and potentially worse outcomes from refractive or cataract surgery, said William Trattler, MD.

### References


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### Accreditation Statement

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education through the joint providership of the American Society of Cataract and Refractive Surgery (ASCRS) and EyeWorld. ASCRS is accredited by the ACCME to provide continuing medical education for physicians.

### Educational Objectives

Ophthalmologists who participate in this activity will:

- Cite the incidence of MGD
- Describe the impact of MGD on outcomes
- Assess meibomian gland structure and function, and why meibography should be integrated as a part of the initial point-of-care workup
- Increase confidence in making therapeutic decisions for patients with variable stages of MGD

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Marjan Farid, MD, has received a retainer, ad hoc fees, or other consulting income from: Allergan, BioTissue, Johnson & Johnson Vision, Kala, and Shire.

### Figure 1. All Meibography Summit respondents think that at least 60% of cataract surgery candidates have MGD.

![Image](image1.png)

### Figure 2. Most respondents think that more than 75% of their OSD patients have MGD.

![Image](image2.png)
Weighing MGD diagnostic techniques

Form and function play an important role in diagnosing MGD

Eighty-one percent of Meibography Summit participants think structure and function are equally significant in the development of MGD-related symptoms (Figure 1).¹

“Each is individually significant, and this is why you cannot only rely on your clinical exam of the lid margin,” said Elizabeth Yeu, MD. Before meibography, she thought structure and function were always coexistent and aligned.

“In fact, they are not. You can have poorly functional meibomian glands. That does not mean there is already structural damage,” she said.

Assessing function

Figure 2 shows Meibography Summit participants’ opinions of routine eyelid evaluation.

Paul Karpecki, OD, thinks questionnaires lead patients to share symptoms they may not mention otherwise, prompting additional testing. He examines the lashes first, looking for scalloped eyelid margins, capped glands, telangiectasia, frothy tears, and lid thickening. At the slit lamp he searches for early biofilm. Then he performs expression with a meibomian paddle.

William Trattler, MD, thinks function is key.² “I look at the health of the eyelids and lashes and the quality of oils that are expressed, and if I identify MGD, I initiate treatment,” he said. If patients do not respond to the initial treatments, he performs meibography.

“They have the terminology ‘non-obvious MGD’ and ‘obvious MGD.’ It’s only non-obvious if you don’t express the meibomian glands,” said Douglas Devries, OD. “Once you have expressed the glands

continued on page 4

Preeya Gupta, MD, has received a retainer, ad hoc fees, or other consulting income from: Alcon, Allergan, Bausch + Lomb, BeaphEx, Focus Labs, NDC, NTK, Oculus, OcuSOFT, Orca Surgical, and Shire. D. Rex Hamilton, MD, has received a retainer, ad hoc fees, or other consulting income from Alcon, Carl Zeiss Meditec, and Johnson & Johnson Vision. Edward Holland, MD, has received a retainer, ad hoc fees, or other consulting income from: Aerie, Alcon/Novartis, Azura, Glaucus, Katena, Kala, Matti, OmegaOptics, Precision Lens, Senju, Shire, Sight Sciences, SightLife Surgical, TearLab, and Vomaris. He has received research funding from: Alcon/Novartis, Matti, Omeros, and Senju. He is a member of the speakers bureau of the Alcon/Novartis, Omeros, Senju, and Shire. Paul Karpecki, OD, has received a retainer, ad hoc fees, or other consulting income from: Aeon, Alcon, Allergan, Bausch + Lomb, Beaver-V Visitec International, BioTissue, BeaphEx, Bruder, Cambium, EyeGate, Eyemagnetizations/Rendia, Focus Labs, Imprimis, Johnson & Johnson Vision, Oasis Medical, Oculus, OcuSOFT, Science Based Health, Shire, Sun Pharmaceuticals, TearFilm, and Topcon. He is a member of the Board of Directors of Silk Technologies and TearLab.

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Donald Korb, OD, is one of the patent holders for relevant ophthalmic devices; however, he has no financial interests related to the patents.

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John Sheppard, MD, has an investment interest in: 1-800-DOCTORS, Alphapen, EyeGate, Eyefx Research, LerciScience, LunterBio, Matti, NovaBay, Newark, OcuHub, OcuCure, Okogen, PLS, RSVP, SARcode, Sternimson, Statham/James Crowne, and TearLab. He has received a retainer, ad hoc fees, or other consulting income from is a member of the speakers bureau of and has received research funding from: AbbVie, Alcon, Allergan, Avedro, Bausch + Lomb, EyeGate, Inspire/Merck, and Sarcom. He has received a retainer, ad hoc fees, or other consulting income from is a member of the speakers bureau of: Bio-Tissue, Eleven, MedEdicus, Nicovis, Omeros, Science Based Health, Talia Technology, and TearScience. He has received a retainer, ad hoc fees, or other consulting income and research funding from: Aldeyra, ArcScan, CiblesE, Clearview, Clementia, Hovione, Isis Pharmaceuticals, Kala, LerciScience, Lux Biosciences, Novalig, Ocular Therapeutics, Okogen, Panoptix, PLS, Shire/SARcode, and Vistakon. He has received a retainer, ad hoc fees, or other consulting income from: 1-800-DOCTORS, BioLayer, Bruder, Imprimis, LayerBio, Lenstain, Matti Therapeutics, NovaBay, Novome, OcuCure, Ocugen, Portage, Sternimson, Sun Pharmaceuticals, Syngen, and Topiwt. He is a member of the speakers bureau of Pfizer, Topiwt, Lumenis, Pentavision, and Spjnicov. He has received research funding from: EyeGate, Glaucus, IntSite Vision, Rutech, Senju, Tear Solutions, and Xoma/Servier.

William Trattler, MD, has an investment interest in ArcScan, Avedro, CXL, and Lantech. He has received a retainer, ad hoc fees, or other consulting income from: Alcon, Allergan, Avedro, Bausch + Lomb, BeaphEx, Guardian Health, Johnson & Johnson Vision, LENSAR, Ocular Therapeutics, Sun Pharmaceuticals, and Shire. He has received research funding from Allergan, Bausch + Lomb, Johnson & Johnson Vision. He is a member of the speakers bureau of Allergan, Avedro, Bausch + Lomb, Johnson & Johnson Vision, NovaBay, Oculus, Sun Pharmaceuticals, and Shire.

Elizabeth Yeu, MD, has an investment interest in Modernizing Medicine and Ocular Science. She has received a retainer, ad hoc fees, or other consulting income from: Alcon, Allergan, Bausch + Lomb, BioTissue, Beaver-V Visitec International, Optics, Johnson & Johnson Vision, Kala, Ocular Therapeutics, OcuSOFT, Omeros, Science Based Health, Shire, TearLab, and TearScience. She is a member of the speakers bureau of: Bio-Tissue, Eleventh, IntSite Vision, and Vistakon. He has received a retainer, ad hoc fees, or other consulting income and research funding from: Aldeyra, ArcScan, CiblesE, Clearview, Clementia, Hovione, Isis Pharmaceuticals, Kala, LerciScience, Lux Biosciences, Novalig, Ocular Therapeutics, Okogen, Panoptix, PLS, Shire/SARcode, and Vistakon. He has received a retainer, ad hoc fees, or other consulting income from: 1-800-DOCTORS, BioLayer, Bruder, Imprimis, LayerBio, Lenstain, Matti Therapeutics, NovaBay, Novome, OcuCure, Ocugen, Portage, Sternimson, Sun Pharmaceuticals, Syngen, and Topiwt. He is a member of the speakers bureau of Pfizer, Topiwt, Lumenis, Pentavision, and Spjnicov. He has received research funding from: EyeGate, Glaucus, IntSite Vision, Rutech, Senju, Tear Solutions, and Xoma/Servier.

Staff members Brad Fundingsland and Laura Johnson have no ophthalmic-related financial interests. Jan Beiting has received a retainer, ad hoc fees, or other consulting income from: AcuFocus, Allegro Ophthalmics, Beaver-V Visitec International, Imprimis, Johnson & Johnson Vision, Novalig, and TearScience. Supported by an unrestricted educational grant from Johnson & Johnson Vision

Figure 1. Most Meibography Summit participants think structure and function are equally significant in the development of MGD-related symptoms.

Figure 2. Most participants think a routine eyelid evaluation should include assessment of meibomian gland structure and function.

Generally, what do you think is more significant in the development of MGD-related symptoms?

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
<th>Both are equally significant</th>
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<tbody>
<tr>
<td>6%</td>
<td>13%</td>
<td>81%</td>
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Should a routine eyelid evaluation include an assessment of meibomian gland structure and function?

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>86%</td>
<td>7%</td>
<td>7%</td>
<td>0%</td>
</tr>
</tbody>
</table>

1. Trattler, MD, et al. Meibography Summit

2. Yeu, MD, et al. Meibography Summit
Integrating meibography into practice

Meibography is expected to take a more significant role in diagnostics

The 2017 ASCRS Clinical Survey showed that less than 20% of respondents are using meibography.

“I think we are going to see some amazing changes in these numbers over the next 5 or 10 years,” said Eric Donnenfeld, MD. “I predict that this is going to be a big change, particularly around cataract surgery.”

“To truly assess meibomian gland dysfunction (MGD), it is equally important to have meibography for structural analysis as well as a functional exam of the lid margin and put that together,” said Elizabeth Yeu, MD.1,2

Role of meibography

John Sheppard, MD, uses meibography as a point-of-care test before examination. “I like to have the meibography done before I see the individual because it yields more information than the slit lamp examination alone; plus, I can show the meibography photographs to the patient,” he said (Figure 1).

“We do point-of-care testing and meibography imaging as initial tests for all cataract and refractive surgery patients,” said Marjan Farid, MD. “This ensures that we catch all occult cases of ocular surface disease and start treatment on them prior to surgery. These patients then also become aware of their dry eye and MGD prior to surgery and are more motivated and compliant with treatment.”

Marguerite McDonald, MD, explained that in her practice meibography is performed for all patients evaluated for surgery, new patients with positive responses on the psychometric test, or well-established dry eye patients who have not had meibography in 6 months.

“I typically have technicians perform meibography on my refractive cataract patients and symptomatic patients,” said Alice Epitropoulos, MD. “This is a more significant role in diagnostics expected to take place.”

If tear breakup time is abnormal, the chance of MGD is high, said W. Barry Lee, MD. “If you do not recognize this before your cataract surgery, you are going to see them after their cataract surgery and they are going to be complaining of this,” he said.

“There is so much we are learning about MGD, and meibography is the key to that,” said Alice Epitropoulos, MD. “It is critical as a tool to assess meibomian gland structure. Meibography adds value in terms of helping to set patient expectations and helping me to be a better diagnostician. I would love to see more people use it.”

References
1. Tomlinson A, et al. The International Workshop on Meibomian Gland Dysfunction indicated MGD may be diagnosed based on a single affected gland.1
2. Marguerite McDonald, MD, said her practice used to image the upper and lower lids with meibography but realized findings were similar in both lids.3 “So, on a routine basis, unless you are in a clinical trial, you do not have to flip that lid,” she said.

The 2011 International Workshop on Meibomian Gland Dysfunction indicated MGD may be diagnosed based on a single affected gland.1

Assessing structure

Some practices use meibography as a point-of-care test in cataract or refractive patients and others in those with signs or symptoms of dry eye. Slightly more than half of Meibography Summit participants think meibography diagnoses the condition earlier.

Marjan Farid, MD, looks for dilation of the glands, shortening and disorganization of the glands, or atrophy and dropout as distinguishing signs of progressive MGD.

Alan Carlson, MD, has a low threshold for performing meibography and asking about symptoms in patients having cataract surgery.2 “Not only is MGD non-obvious to the examiner in many cases, it’s non-obvious to the patient,” he said.

“These are typically older patients who tend to have a relatively neurotrophic cornea, so they may not feel the symptoms,” said D. Rex Hamilton, MD.

“Functional effects may not be seen until the loss is more significant,” Dr. Farid said. “I have been impressed by how many younger patients that I would not expect to have MGD have significant MGD and do not know it,” she said. “So now, with the younger corneal refractive or LASIK evaluation patients that come in, I make it a point to perform meibography.”

Not only is MGD non-obvious to the examiner in many cases, it’s non-obvious to the patient.

—Alan Carlson, MD
point-of-care exam gives us an abundance of information. It helps to identify the disease and educate our patients and guides the discussion about the disease.”

Various practices use different tests to prompt meibography. “In our clinic, any time a patient has tested positively for either increased osmolarity or increased inflammation, that will trigger the dry eye workup,” said Douglas Devries, OD. “During the dry eye workup, every OSD suspect will have meibography performed on them.”

One step further
“One of the limitations of point-of-care testing such as osmolarity or MMP-9 is that it does not differentiate between MGD and aqueous-deficient dry eye, so meibography gives you a good basis for deciding what form of dry eye you should be treating,” Dr. Donnenfeld said.

“Meibography has been a game changer,” said Terry Kim, MD. “It finally allows us to link the structural components of the disease process to the functional component of the disease process via an imaging modality that is easily interpreted by the eye care provider and easily explainable to the patient.”

D. Rex Hamilton, MD, suggested that it may be important to look at younger patients more closely and on a routine basis. “I saw a 31-year-old patient who had previous LASIK and had intractable dry eye symptoms. Typically we consider this to be a very unusual demographic to have that problem. We looked at his meibomian glands and he clearly had issues,” he said.

Advancing patient education
Meibography and tear breakup time devices allow clinicians to educate patients about MGD.

“When you show patients the images of their glands and they can see firsthand that they have obstructed glands and you compare that with a normal image, it is a tremendous educational tool and the patient’s understanding of the disease progresses much faster,” said Edward Holland, MD.

“This education drastically speeds up the conversation on the significance of MGD and allows the discussion to go on to treatments.”

“Any time you can perform an objective test, including imaging, that educates patients on their specific eye condition, it will result in a call to action and the patient electing to be treated more aggressively,” Dr. Devries said.

Meibography also helps clinicians monitor treatment response and set expectations. “Once they have a single thermal pulsation treatment, they will likely need another at some future date due to the chronic, progressive nature of MGD,” said Frank Bowden III, MD. “It is important to use metrics such as meibography and tear film lipid layer thickness to help patients understand and see the value of procedures to address meibomian gland obstruction.”

Looking ahead
“My advice to my colleagues in optometry and ophthalmology is that if MGD is not being diagnosed in your office, you need to incorporate this,” Dr. Donnenfeld said. “This is a great place for bringing ODs into MD practices to work together to manage this disease.”

In the future, Dr. Farid expects to see multifunctional meibography devices with add-on point-of-care testing. “I think that is when we will see a huge increase in usage. Practices will be able to invest in a comprehensive system to evaluate multiple components of the tear film and ocular surface,” she said.

References

Figure 1. Dynamic illumination shows truncation.

Figure 2. Most participants think meibography should be performed on a routine basis if a patient has OSD symptoms.

“It is important to use metrics such as meibography and tear film lipid layer thickness to help patients understand and see the value of procedures to address meibomian gland obstruction.”

—Frank Bowden III, MD
Early diagnosis and treatment essential for meibomian gland dysfunction

Early detection enables proactive management of meibomian gland dysfunction

Experts agree that early treatment is optimal in halting meibomian gland dysfunction (MGD).1

“If we start treating these patients and intervene at an earlier stage of their disease, they are more likely to respond better than if we wait until their glands are atrophied and non-functional,” said Alice Epitropoulos, MD.

Frank Bowden III, MD, likened MGD early diagnosis and intervention to preventive dental care. “I tell patients that you do not wait until your teeth are loose and your mouth hurts before you start brushing and flossing your teeth,” he said. “In that respect, MGD treatment measures when we detect any alteration in meibomian gland structure or function.”

“Chronic, progressive diseases associated with structural damage, such as MGD, are more easily, economically, efficiently, and effectively treated earlier in their course, and thermal pulsation is valuable by allowing earlier diagnosis and treatment,” said Alan Carlson, MD.

Symptoms and treatment

Patients often have non-obvious symptoms (figure 1).2 “The most severe patients with the most clinical findings tend to have chronic disease, and with a longer disease, the symptoms of pain and burning and the classic dry eye symptoms lessen over time,” said Edward Holland, MD. “This occurs because the chronic patient develops somewhat of an anesthetic cornea.”

“One of the most telling symptoms for MGD is fluctuating vision because it is instability of the tear film and the higher-order aberrations that come into play, especially when patients say they cannot read for long periods of time,” said Marjan Farid, MD.

“If clinicians can identify symptoms and help patients realize that they have a disease, there will be more buy-in in terms of treating it,” said Preeya Gupta, MD.

Initiating MGD treatment

Douglas Devries, OD, recommends baseline meibography in primary care practices, which would lead to earlier treatment in not only surgical candidates but contact lens patients as well. “I think performing baseline meibography will create a paradigm shift toward more proactive care for our patients,” he said.

Treatment options abound, including artificial tears and lubricants, oral omega fatty acid supplements, lid hygiene, warm hydrating compresses, cyclosporine, lifitegrast, thermal pulsation, topical and oral antibiotics, and more.

William Trattler, MD, typically begins with hypochlorous acid. If patients do not respond, he performs meibography and progresses to other treatments.

“Other initial therapies include warm compresses and oral omega-3s,” Dr. Trattler said. “I do not think that the DREAM study has convinced me that omega-3s do not have a role in the therapy of MGD.”3

Meibography helps guide treatment. “Prognostically, I know my patients with poor function but good architecture respond better to thermal pulsation,” said Elizabeth Yeu, MD. Furthermore, irregular steps on meibography indicate a progressive process that needs to be addressed aggressively, she said.

Marguerite McDonald, MD, explained that MGD can be treated with hot compresses and lid scrubs, antibiotic ointment, and oral doxycycline, but the peer-reviewed literature shows that thermal pulsation therapy is more effective.4

Before thermal pulsation, Terry Kim, MD, performs a manual debridement of the lid margin to remove any mechanical obstruction, such as keratinization, of the meibomian gland orifices, resulting in improved efficacy of the thermal pulsation treatment. Patients are then instructed to continue with maintenance therapy, such as a microwavable mask and lid cleansers.

Surgical patients

If MGD is not addressed and treated before cataract and refractive surgery, it impacts preoperative measurements and postoperative outcomes and patients may blame their...
surgery—or surgeon.

A majority of Summit participants think symptomatic MGD should be treated prior to proceeding with cataract or refractive surgery (Figures 2 and 3).

Dr. Epitropoulos recommended assessing patients for anterior blepharitis and initiating lid cleansers before cataract surgery to help optimize the ocular surface and reduce the risk of endophthalmitis.

Microblepharostimulation may also significantly reduce the risk of postoperative endophthalmitis potentially by lowering the lid margin bacterial presence, Dr. Bowden said.

**Antibiotics and future developments**

Because of the systemic side effects of oral tetracyclines, researchers are investigating topical preparations. John Sheppard, MD, said, “With topicals, we have some great advantages, and those include a higher local concentration, the absence of systemic toxicity, and the ability to use prolonged therapy without some of these concerns, including phototoxicity, gastrointestinal irritability, esophagitis, gastritis, and teratogenicity,” he said. A topical minocycline preparation has shown promise in recent investigations, and subsequent Phase 2 and early Phase 3 trials are planned, he said. Topical doxycycline proved effective for dry eye patients during a Phase 2 protocol 10 years ago by Alacritity Bioscience, he added.

Nevcr modified thermal pulsation devices are also being developed, which may reduce patient expense, Dr. Sheppard said. In addition, several startup companies are taking novel approaches to MGD, derived from other specialties including dermatology, he said.

**Conclusion**

In the last decade, eye care providers have increasingly recognized the importance of diagnosing and treating MGD. “As diagnostics improve, such as the revolution created by meibography, as therapeutics improve, such as the recently decreased activator cost for thermal pulsation therapy, and delivery systems improve for useful drugs like the tetracycline class, life will only become better for our patients,” Dr. Sheppard said.

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**Pioneers lay groundwork for MGD intervention**

More than three decades ago, Donald Korb, OD, and Antonio Henriquez, MD, PhD, and their research team sought to find the reason for contact lens intolerance despite advances in lens technology.

They discovered a syndrome where patients had reduced meibomian gland secretions and dry eye symptoms. They coined the term meibomian gland dysfunction (MGD), stating that it resulted from meibomian gland obstruction, leading to a reduction in oil secretion and an inflammatory process. It is now known that the inflammation can lead to atrophy of the glands.

“Since then we know that MGD is the leading cause of not only dry eye throughout the world, but we know that it is the major cause of contact lens discomfort with all contemporary contact lenses,” Dr. Korb said. It is also the major cause of patients terminating contact lens wear, he added.

MGD treatment can improve comfort and lengthen contact lens use. Blackie et al. reported that when MGD was treated with thermal pulsation, contact lens wear increased by 4 hours.

However, Dr. Korb explained, MGD may not be obvious. “Number one, you have to look for it,” he said. “Number two, you have to know how to look for it. There are two ways: structure and function.” He recommended meibography to assess structure and a handheld device that applies the pressure of a blink to the meibomian glands to assess function.

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**Editors’ note:** Dr. Korb is one of the patent holders of LipoScan, LipiFlow, and the Meibomian Gland Evaluator (Johnson & Johnson Vision) but has no financial interest.

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**References**

1. A 67-year-old woman presents for cataract surgery complaining of fluctuating vision. Her slit lamp exam reveals clear corneas with no fluorescein staining, an abnormal tear breakup time, and 2+ nuclear sclerotic cataracts. Which of the following tests would be the most helpful in diagnosing the etiology of her symptoms?
   a. Corneal topography
   b. Meibography
   c. Tear osmolarity/MMP-9 testing
   d. Glare testing

2. A 35-year-old Caucasian male presents with interest in refractive surgery since he can no longer tolerate contact lenses. He spends more than 9 hours a day on digital devices and has red eyes, blurred vision, dryness, burning, and irritation. Meibography shows more than 50% atrophy of his meibomian glands, osmolarity measures 328 OD and 318 OS, and expression is primarily paste-like or non-expressive. What treatment is best given his age and level of disease?
   a. Begin with artificial tears
   b. Warm washcloth for 10 minutes and dilute baby shampoo to clean the eyelids
   c. Thermal pulsation and at-home hydrating compresses, blepharoexfoliation with at-home lid scrubs, topical anti-inflammatory treatment (corticosteroids or lifitegrast or cyclosporine), and oral doxycycline
   d. Lid scrubs, artificial tears, and omega fatty acids

3. A 77-year-old patient presents for a cataract evaluation. Her main complaint is progressively worsening vision that is further decreased with driving and reading for prolonged amounts of time. Which is not a consideration for this preoperative evaluation?
   a. Corneal topography
   b. Advanced biometry
   c. Meibography
   d. Fluorescein angiogram

4. Which of the following is true regarding meibomian gland dysfunction?
   a. Pregnancy is a risk factor.
   b. Prostaglandin analog users are likely to have MGD.
   c. Meibomian gland structure and function are significantly aligned in patients with MGD.
   d. All MGD is obvious and clinically significant on examination.

5. A 62-year-old woman undergoes preoperative cataract surgery evaluation. Astigmatism on corneal topography measures 1.6 D at axis 85, whereas astigmatism on optical biometry measures 0.8 D at axis 117. Slit lamp examination reveals mild to moderate MGD with a rapid tear film breakup time. What would your next step be?
   a. Schedule a toric IOL to reduce the average astigmatism between optical biometry and topography
   b. Initiate lid hygiene and topical anti-inflammatory therapies to improve the ocular surface and ask the patient to return to repeat measurements
   c. Inform the patient that she is not a candidate for an astigmatism-correcting IOL
   d. Initiate artificial tear therapy and ask the patient to return 3 days later for repeat testing

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