# POINT-OF-CARE TESTING CAN UNLOCK THE DOOR TO THE RIGHT TREATMENT FOR DRY EYES

A healthy ocular surface is a must for optimal eye care.

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From the cataract patient expecting refractive surgery–like outcomes, to the contact lens wearer seeking all-day comfort, to the glaucoma patient wishing to maximize therapeutic benefits, all eye care patients have a goal in mind. Regardless of their situation, these patients need a healthy ocular surface in order to achieve their desired outcomes.

To identify patients with ocular surface disease (OSD) and choose the optimal individualized treatment strategy for each one requires data. Several point-of-care diagnostic devices are available to help gather these data.

First, tear osmolarity testing provides a key diagnostic metric to assist eye care providers in determining next steps when it comes to additional testing and proper therapy. When tear fluid volume is reduced, as in dry eye disease (DED), osmolarity

increases. Second, DED is often accompanied by inflammation of the ocular surface, which can be measured by matrix metalloproteinase 9 (MMP-9). Third, meibography can be used, along with these other indicators at the top of the diagnostic tool pyramid, to effectively direct treatment and determine severity level.

This article presents tips for using these key point-of-care diagnostics to expedite the identification of DED and the initiation of treatment.

## AT A GLANCE

- Several point-of-care diagnostic devices are available to help gather data to determine the presence and severity of ocular surface disease.
- Tear osmolarity testing, evaluation of inflammatory markers, and assessment of meibography are at the top of the dry eye diagnostic pyramid.
- Treatment can be given in a stepwise fashion, depending on the severity of underlying disease.

## WHERE TO START

With a validated questionnaire, physicians can capture subjective information about patients' ocular surface discomfort, vision symptoms associated with DED, and the overall impact of these conditions on their daily lives. Patients who score at an established threshold can then automatically undergo point-of-care testing. It is helpful if the questionnaire used is reproducible and responsive to change in status, and if it has published diagnostic score criteria to screen for patients who may need further testing.

A positive response from the questionnaire—for example, identification of fluctuating vision, eye fatigue, or burning—should lead to evaluation of the three metrics named above: osmolarity, inflammation, and meibography.

## OSMOLARITY TESTING

Tear hyperosmolarity is considered to be the trigger for a cascade of signaling events within surface epithelial cells.[1] The TearLab Osmolarity System (TearLab) measures the osmolarity of tears with easy-to-interpret data, making the results informative whether normal or abnormal.

An elevated reading (>300 mOsm/L) or an intereye difference of greater than 8 mOsm/L indicates instability of the tear film.[2,3]

- Mild: 300–320 mOsm/L
- Moderate: 320–340 mOsm/L
- Severe: ≥340 mOsm/L

The TearLab Osmolarity Test Card provides a quick and simple method for determining tear osmolarity using nanoliter volumes of tear fluid collected directly from the eyelid margin.

## INFLAMMATION TESTING

Stressed epithelial cells on the ocular surface produce MMP-9. These proteolytic enzymes destabilize the tear film by breaking down tight junctions and facilitating inflammatory cell migration. This mechanism creates corneal dysfunction. MMP-9 is elevated in the tears of patient with DED, correlating with examination findings in moderate to severe dry eye.[2-6] The normal range of MMP-9 levels in human tears is 3–40 ng/mL.

InflammaDry (Quidel) recognizes elevated levels of MMP-9 in tear fluid samples taken from the palpebral conjunctiva. The test is highly accurate (85% sensitivity and 94% specificity[7]), and results are obtained in 10 minutes.

## MEIBOGRAPHY

Meibomian gland dysfunction is present in 86% of patients with DED.[8] Imaging of the meibomian glands can be easily and noninvasively performed to identify gland atrophy in patients with OSD. Signs of OSD include duct dilation, gland constipation, curling and shortening (atrophy) of glands, hazy appearance, and dropout. Devices for performing meibography include the LipiScan (Johnson & Johnson Vision), the Keratograph 5M (Oculus Optikgeräte), and the HD Analyzer (Visiometrics).

Meibography is a powerful motivator when it comes to compliance with therapy.

## FOLLOW-UP VISIT 1

After initial examination, patients should be scheduled for a follow-up visit and further evaluation. Scheduling DED treatments separate from the routine exam and DED testing ensures that the eye will be undilated and free of numbing drops. It also leads to appropriate reimbursement for the physician.

At follow-up visit 1, osmolarity and inflammation testing should be repeated if it has been longer than 2 months since first visit. Fluorescein and lissamine green staining and meibomian gland diagnostic expression should be performed at this visit; these measures help to correlate function with the structural information conveyed by meibography. These tests help to determine the level of the DED and thereby determine treatment recommendations

Ultimately, DED management is targeted toward restoring homeostasis to the ocular surface and team film. Ongoing management will typically include a combination of approaches to address multiple aspects of the patient's condition.

## TREATMENT

Stepwise treatment algorithms provide a way to organize treatments,

## STEPWISE THERAPY FOR DRY EYE DISEASE AS DESCRIBED IN TFOS DEWS II[1]

**Step 1**
- Education regarding the condition and its management, treatment, and prognosis
- Modification of local environment
- Education regarding potential dietary modifications (including oral essential fatty acid supplementation)
- Identification and potential modification or elimination of offending systemic and topical medications
- Ocular lubricants (if MGD is present, consider lipid-containing supplements)
- Lid hygiene and warm compresses

**Step 2**
- Nonpreserved ocular lubricants to minimize preservative-induced toxicity
- Tea tree oil treatment for *Demodex* (if present)
- Tear conservation with:
  - Punctal occlusion
  - Moisture chamber spectacles/goggles
- Overnight treatments (ointment or moisture chamber devices)
- In-office physical heating and expression of the meibomian glands (including device-assisted therapies, such as LipiFlow Thermal Pulsation System [Johnson & Johnson Vision]) as per meibography
- In-office intense pulsed light therapy for MGD
- Prescription drugs for DED if positive for inflammation, including:
  - topical antibiotic or antibiotic/steroid combination applied to the lid margins for anterior blepharitis (if present)
  - topical corticosteroid (limited duration)
  - topical secretagogues
  - cyclosporine ophthalmic emulsion 0.05% (Restasis, Allergan)
  - lifitegrast ophthalmic solution 5% (Xiidra, Shire)
  - oral macrolide or tetracycline antibiotics

**Step 3**
- Oral secretagogues
- Autologous or allogeneic serum eye drops
- Therapeutic contact lenses, options including:
  - Soft bandage lenses
  - Rigid scleral lenses

**Step 4**
- Topical corticosteroid for longer duration
- Amniotic membrane grafts
- Surgical punctal occlusion
- Other surgical approaches (tarsorrhaphy, salivary gland transplantation)

Abbreviations: DED, dry eye disease; MGD, meibomian gland dysfunction; TFOS DEWS II, Tear Film and Ocular Surface Society Dry Eye Workshop II

from those likely to benefit the most patients to those that are more specific and advanced. The Tear Film and Ocular Surface Society Dry Eye Workshop II (TFOS DEWS II) defined DED as a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiologic roles.[1]

If patients have elevated tear osmolarity combined with inflammation, prescription therapy is likely indicated. Not all DED patients, however, have clinically significant inflammation; therefore, MMP-9 testing helps to predict who may respond favorably to antiinflammatory agents.

With low tear osmolarity testing but high inflammatory markers, other non-DED entities should be considered, such as epithelial basement membrane dystrophy or the presence of infiltrates or allergic disease. Most DED patients have meibomian gland dysfunction (MGD), necessitating treatment for lid disease.

The TFOS-DEWS II report organized therapy options in a stepwise fashion (see *Stepwise Therapy for Dry Eye Disease as Described in TFOS DEWS II*). Steps 1 and 2 can be considered at the first follow-up visit, and steps 3 and 4 may better be reserved for consideration at subsequent visits.

How long to try a treatment before considering change is highly variable; typically, treatment effects are observed within 1 to 3 months, although some therapies may take longer to work.

### FOLLOW-UP VISITS 2 AND 3

After 2 to 3 months of therapy, inflammation and osmolarity testing should be repeated. The clinician should monitor for a reduction in the delta between the two eyes, looking for evidence of a downward trend.

A decline in osmolarity demonstrates

treatment efficacy and reassures patients, once again showing them a metric. Explaining test results can help encourage patients to continue with their treatment. As the markers of OSD fluctuate, point-of-care testing helps identify trends, providing information imperative to therapeutic decision-making.

Most patients will be successful with step 2 and 3 treatments. At the third follow-up visit, if patients are not improving on current therapy, move to treatment steps 3 and 4.

## KNOWLEDGE IS POWER

Along with the slit-lamp examination, the results from these three investigations—osmolarity, inflammation, and meibography—provide physicians with a stepping-off point for determining treatment. For patients, the diagnostic information enables them to better understand and visualize their conditions.

Gathering and monitoring key data points allows physicians to provide streamlined, accurate, effective treatment. Tear osmolarity and MMP-9 testing are at the top of the diagnostic pyramid. Along with meibography and meibomian gland expression, these data points provide the keys for physicians to get started with appropriate care so that patients experience a rapid return of a healthy ocular surface. Correlating test results with subjective information such as how patients feel and what the physician sees can empower a complete approach to care for DED. ■

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