

# Strategies for Optimizing the Ocular Surface Prior to Cataract Surgery

Sponsored by PRN



The health of the ocular surface may be an underappreciated variable in the refractive outcome.

BY CYNTHIA MATOSSIAN, MD

Advancements in technology and surgical techniques have improved the ability of ophthalmic surgeons to offer predictable refractive outcomes after cataract surgery, but one aspect of the presurgical workup that may be overlooked in terms of outcomes is assessing the health and viability of the ocular surface. An unhealthy ocular surface prior to surgery can have myriad implications, such as improper measurement of the axis and magnitude of astigmatism, IOL power calculation errors, and improper or unnecessary disqualification of patients from multifocal and other advanced technology lens options. Most profoundly, however, failure to optimize the ocular surface may negatively affect visual results and surgical outcomes.

The health of the ocular surface is no small consideration in the cataract surgery population. Several studies highlight that the prevalence of meibomian gland dysfunction (MGD) is on the rise. This may be due to increased awareness of the problem or other multifactorial reasons; regardless, the numbers suggest that ophthalmologists should be vigilant about identifying and treating MGD prior to surgery. According to one study, MGD is present in 37% of patients in ophthalmic practices and in 47% of patients in optometric practices, although prevalence of some degree of MGD has been reported to be as high as 87%.<sup>1</sup> Studies have also shown that MGD is a leading cause of dry eye disease (DED), accounting for upwards of 86% of cases.<sup>2</sup>

## IMPLICATIONS OF OCULAR HEALTH

Because as much as 75% of the refractive power of the eye occurs at the tear film interface, an unhealthy ocular surface can cause instability in refractive measurements and can lead to inconsistent sphere and cylinder readings.<sup>3</sup> Moreover, visual acuity becomes affected due to a rapid tear break up time that requires forced or increased blinks to achieve visual clarity. It has become abundantly clear that an unhealthy ocular surface can undermine the accuracy of all the advanced technology that eye surgeons have access to for keratometry, topography, and wavefront imaging. As the saying goes, garbage in, garbage out—and an unhealthy ocular surface can certainly lead to inaccurate (garbage) measurements.

A lot depends on the accuracy of preoperative measurements. Most prominently, miscalculating the axis or magnitude of astigmatism

on keratometry or topography due to instability in the ocular surface can lead to errors in the IOL calculation. This, in turn, can yield a refractive surprise after surgery and a need for additional surgical procedures—PRK, LASIK, or even an IOL exchange—to achieve the original refractive goals.

Data from a recent clinical trial elucidate this point: a multi-center clinical trial demonstrated that patients with hyperosmolarity greater than or equal to 308 mOsm had increased variability in keratometric readings.<sup>3</sup> In the study, 8% of hyperosmolar eyes demonstrated a 0.5 D difference in average K readings between two consecutive visits, and 17% of hyperosmolar eyes had greater than a 1.0 D difference between two visits. However, no eyes with normal osmolarity readings demonstrated differences in keratometric readings between visits. The implication of the study is that keratometric inconsistencies could cause 1 of 10 patients to have an incorrect IOL calculation.

## DIAGNOSIS, EVALUATION, TREATMENT

Diagnosing ocular surface issues, and MGD and DED in particular, is a result of a clinical evaluation and targeted diagnostic testing. In our clinic, we use a dry eye questionnaire at the time of all annual eye examinations or for visits when the chief complaint is focused on ocular surface issues. We have incorporated pertinent questions from the ocular surface disease index (OSDI) and Standard Patient Evaluation of Eye Dryness (SPEED) questionnaires into our electronic medical records system to document our patients' responses into the History of Present Illness (HPI) segment of the office visit.

In addition to the dry eye questionnaire, we use Tear Osmolarity testing (TearLab) to identify irregularities in osmolarity as well as inter-ocular variability of greater than 8 mOsm. We also use the InflammDry (RPS) point of care test, which demonstrates the existence of pro-inflammatory MMP-9 biomarkers in the tear film; placido disc imaging with our Nidek OPD III unit; and lissamine green staining of the conjunctival and corneal surfaces.

The results of these tests are always shared with patients so they can better understand the health of their ocular surface. And that is because we have found that the better educated patients are about their ocular surface, and the more they comprehend the chronicity of MGD and DED entities, the better they adhere to the prescribed

**TABLE. EFFECT OF 12 WEEKS OF SUPPLEMENTATION WITH RE-ESTERIFIED OMEGA-3 FATTY ACIDS IN A CLINICAL TRIAL (N = 105)**

|                                 | Baseline               | 6 weeks                  | 12 weeks                 |
|---------------------------------|------------------------|--------------------------|--------------------------|
| <b>Tear Osmolarity (mOsm/L)</b> |                        |                          |                          |
| Placebo                         | 326.0±15.4, and mOsm/L | 317.0±20.5               | 317.7±19.7               |
| Omega-3 group                   | 326.2±15.8             | 309.4±13.4<br>(P = .042) | 306.9±12.1<br>(P = .004) |
| <b>OSDI</b>                     |                        |                          |                          |
| Placebo                         | 27.1± 22.9             | 19.6 ±17.0               | 22.0±19.3                |
| Omega-3 group                   | 32.4±19.2              | 21±14.4<br>(P = .285)    | 15.5±11.0<br>(P = .002)  |
| <b>Tear Break up Time</b>       |                        |                          |                          |
| Placebo                         | 4.61±2.04              | 5.55±2.43                | 5.81±3.13                |
| Omega-3 group                   | 4.78± 2.96             | 6.64 ± 3.17              | 8.25±4.78                |

treatment regimen.

We treat the ocular surface based on the severity of the disease and use a customized, stepwise approach. Use of one or more of the following is fairly typical for most patients: omega-3 oral supplements in the re-esterified triglyceride (rTG) form, hypochlorous acid lid cleanser, cyclosporin 0.05% ophthalmic emulsion, a microwaveable heated eye mask, intense pulsed light, or short term topical steroids or a combination of antibiotic and steroid ointment.

## NUTRITION AND THE OCULAR SURFACE

Omega-3s, specifically eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are the only active omega-3s useful to the body for normalizing meibum composition. These essential nutrients, which are abundant in wild marine sources (ie, fresh fatty fish), are best acquired through dietary sources.

Personal eating habits play an important role in whether enough omega-3s are ingested on a regular basis. The average Western Diet is very low in omega-3s; unless patients supplement their diets with mercury-free omega-3s in the same form as that found in fish (triglyceride form), they will be nutritionally deficient. As a consequence, their meibomian glands will not produce an optimal lipid layer—the outer most layer for the tear film—which, in turn, will lead to ocular dryness due to the rapid evaporation of the exposed aqueous layer.

Unfortunately, fresh wild fish are not easily obtained and have been shown to be high in impurities such as polychlorinated biphenyls (PCBs), dioxins, and mercury. Farm raised fish are grain fed, and, therefore, do not contain omega-3s. Their value as a dietary source of omega-3s is little to none.

Because of their importance to the health of the ocular surface, and given the difficulties patients typically have in incorporating appropriate dietary sources of omega-3s in their diets, both the Dry Eye Workshop (DEWS) and International Workshop on Meibomian Gland Dysfunction recommend omega-3 supplementation. The thinking behind the recommendation is that omega-3 oral supplements, used in conjunction with other dry eye treatments, will help the meibomian glands produce healthy meibum. According to research, 2 to 3 grams of EPA/DHA in a naturally occurring form (ie, rTG) and in a formulation that is free of impurities is necessary to offset the nutritional deficiency as long-term therapy.<sup>4,5</sup>

Other evidence is emerging that supplementation can impart a beneficial effect on the health of the ocular surface. According to a multicenter, prospective, interventional, placebo controlled, double masked, randomized trial, oral consumption of re-esterified omega-3 fatty acids (1,680 mg EPA and 560 mg DHA once daily for 12 weeks) effectively improved osmolarity readings, OSDI scores, and tear break up time at the end of the study (Table).<sup>6</sup>

## CONCLUSION

The health of the ocular surface may be an underappreciated variable in the refractive outcome after cataract surgery. The presence of MGD or DED can cause visual disturbances in and of themselves, but they can also affect the accuracy of keratometric and topographic measurements; this, in turn, can yield inaccurate IOL power calculations. However, steps can be taken to identify issues and initiate treatment that can normalize the health of the ocular surface prior to surgery. Emerging evidence, as well as recommendations from leading sources of MGD and DED treatment guidelines, strongly suggests a role for re-esterified omega-3 fatty acid supplementation to offset the nutritional deficiency of essential Omega-3s (EPA/DHA) needed to normalize the meibum.<sup>7</sup> ■

1. Trattler W, Reilly C, Goldberg D, Majmudar P, Vukich J, Packer M, Donnenfeld E. Cataract and dry eye: Prospective Health Assessment of Cataract Patients' Ocular Surface Study. Poster, American Society of Cataract and Refractive Surgery Annual Symposium and Congress. San Diego; March 2011.
2. Lemp MA1, Crews LA, Bron AJ, Foulks GN, Sullivan BD. Distribution of aqueous-deficient and evaporative dry eye in a clinic-based patient cohort: a retrospective study. *Cornea*. 2012 May; 31(5):472-8. doi: 10.1097/ICO.0b013e318225415a.
3. Matossian C, Epitropoulos E, Berdy G. Study demonstrates hyperosmolarity of the ocular surface may impact cataract surgery planning. Presented at: ESCRS 2014; September 13-17, 2014; London.
4. Smith, SG. Focus on meibomitis. *Advanced Ocular Care*. 2011; March 2011;2:26.
5. Donnenfeld, E. You are what you eat. *Cataract and Refractive Surgery Today*. 2012;11:5.
6. Epitropoulos, A, Donnenfeld, E, Matossian C, et al. Effect of oral re-esterified omega-3 nutritional supplementation on tear osmolarity. Presented at: ASCRS 2015; April 17-21, 2015; San Diego.
7. Smith SG. Investigational Study, 3:1 rTG Omega-3 (1680mg EPA/560mgDHA) abstract. Presented at: ASCRS 2013; April 19-23, 2013; San Francisco, California.

### Cynthia Matossian, MD

- founder and CEO of Matossian Eye Associates, Pennsylvania and New Jersey; clinical instructor/adjunct faculty member at Temple University School of Medicine, Philadelphia, and Robert Wood Johnson Medical School, New Brunswick, New Jersey
- cmatossian@matossianeye.com
- financial disclosure: TearLab, InflammaDry, PRN, Restasis, and Nidek