Keying in on keratometry

by Maxine Lipner EyeWorld Senior Contributing Writer

Studying the effect of tear osmolarity in cataract surgery planning

What role does tear osmolarity have on the repeatability of keratometry measurements in patients presenting for cataract surgery? Results from a study published in the August 2015 issue of the Journal of Cataract & Refractive Surgery indicated that those with hyperosmolarity had a statistically significant higher variability in the average K reading used for IOL power calculations than those in the normal osmolarity group, according to Alice Epitropoulos, MD, clinical assistant professor, The Ohio State University Medical Center, and the Cataract & Refractive Center of Ohio, Columbus, Ohio.

Such measurements have an important role in post-cataract visual acuity. “Accurate IOL power calculations are essential to ensure good uncorrected vision after cataract surgery,” Dr. Epitropoulos said. “This is especially true for patients who are interested in premium lenses because an accurate refractive outcome is so important to patient satisfaction.”

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Investigating hyperosmolarity

“Precise keratometry relies on a good reflection of the mires from the corneal surface,” Dr. Epitropoulos said. Because an unstable tear film reduces the quality of corneal reflection, this can compromise the K readings.

With this in mind, investigators hypothesized that it is of considerable value to identify patients with a compromised ocular surface and accompanying tear film instability prior to cataract surgery, Dr. Epitropoulos reported. By identifying this group, the hope was to increase confidence in K readings with appropriate treatment.

Included in the study were 50 patients presenting for routine cataract surgery who had hyperosmolarity and 25 with normal osmolarity. Each eye was measured 2 different times, up to 3 weeks apart.

Investigators found that there was a statistically significant higher variability in the average K readings in the hyperosmolar group. “We found that 10% of these hyperosmolar patients had a difference in IOL calculation of 0.5 D or more,” Dr. Epitropoulos said. “That’s significant, especially in patients interested in premium lenses because an accurate refractive outcome is so important to patient satisfaction.”

A key component to all IOL power calculation formulas is accurate measurement of anterior corneal curvature as measured by keratometry, she said, adding that this can vary significantly if the ocular surface is unstable.

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sensitivity of the cornea from damaging effects of dry eye might be a contributing factor to the lack of symptoms, despite advanced surface signs of dry eye. “This points to the need for objective testing for dry eye disease prior to cataract surgery,” she said. “Patients aren’t going to always present with symptoms of dry eye so you can’t rely on symptoms alone.”

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Clinical perspective
From a clinical perspective, Dr. Epitropoulos said that ocular surface disease is the root of what causes many patients to be unhappy or unsatisfied after cataract surgery. “It’s critical that we evaluate and identify dry eye patients preoperatively because I want to avoid unhappy patients after cataract surgery, and tear osmolarity helps me to identify this,” she said. “It’s so important to identify patients who may not be symptomatic with their dry eye and tell them that they’re on the verge of moving from asymptomatic to symptomatic and that the surgery may be what puts them over the edge.” If physicians don’t identify this preoperatively, the patient may blame the physician when their dry eye becomes symptomatic after surgery, thinking that the cataract surgery caused their dry eye. “By recognizing and diagnosing dry eye disease before surgery, we can avoid unhappy patients by managing the disease before it becomes a problem,” Dr. Epitropoulos said.

She pointed out that practitioners should also be aware that dry eye patients have large swings in the tear osmolarity between their 2 eyes. “Normal osmolarity patients don’t have much fluctuation or variability in their osmolarity scores,” Dr. Epitropoulos said. “But dry eye patients tend to have more variability—that’s 1 of the diagnostic criteria that we look at.” Practitioners can identify dry eye patients using osmolarity if the number is greater than 308 or if there is more than an 8 milliosmole difference between the 2 eyes.

“There is increasing evidence that evaluating tear osmolarity provides crucial information about disease severity and therapeutic response,” she said. “Physicians can use this point-of-care test to help diagnose and follow dry eye disease, educate patients about this condition, and treat them; when patients come back for follow-up, they like to see if their ‘number’ has improved.” This is something that can assist with compliance, helping to ensure that patients follow the prescribed treatment regimen.

Tear osmolarity should be used as a tool, but in conjunction with other tests. There are other valuable ways of evaluating dry eye such as looking at tear breakup time and corneal staining, looking for the presence of meibomian gland dysfunction (including meiography), using InflammaDry (Rapid Pathogen Screening, Sarasota, Florida), and looking at corneal topography, Dr. Epitropoulos said.

The treatment regimen that she uses in mild to moderate and severe dry eye cases centers on reducing inflammation of the ocular surface. “I use topical cyclosporine perioperatively, and that can be very helpful with increasing the natural tear production, reducing inflammation, and treating unstable hyperosmolar tear films,” Dr. Epitropoulos said.

“I also use a topical corticosteroid preparation that’s friendly to the ocular surface and safe and effective to rapidly reduce inflammation; it works synergistically with cyclosporine.”

Dr. Epitropoulos routinely starts her dry eye patients on a re-esterified omega-3 nutritional supplement, which she pointed out has been proven to benefit patients with dry eye disease and improve tear osmolarity. “We did a multicenter trial that demonstrated a significant improvement in symptom scores, tear osmolarity, tear breakup time, omega-3 index scores, and a significant reduction in MMP-9 positivity.

“In addition, I think an effective treatment for evaporative dry eye is the LipiFlow thermal pulsation system [TearScience, Morrisville, North Carolina],” Dr. Epitropoulos said. “It’s the only FDA-cleared treatment for evaporative dry eye disease, and it helps to prevent progression of the disease.” This can also help to stabilize the tear film prior to cataract surgery, she said.

Following diagnosis and aggressive treatment of ocular surface disease, Dr. Epitropoulos finds her patients have less refractive surprises. “I’m able to achieve my target more consistently, with overall improved patient outcomes,” she concluded. EW