

News in Review

COMMENTARY AND PERSPECTIVE

CORNEA

Gauging Fuchs Prognosis With Scheimpflug Tomography

RESEARCHERS AT MAYO CLINIC HAVE harnessed a common imaging technology in a way that may be a game-changer in assessing Fuchs endothelial corneal dystrophy (FECD).¹ Using Scheimpflug imaging, they found that the presence of three parameters—loss of regular isopachs, displacement of the thinnest point of the cornea, and focal posterior surface depression—could be used to predict risk of disease progression or need for surgical intervention.

And although central corneal thickness (CCT) is often used to gauge whether keratoplasty is needed, CCT proved to be a weak predictor of prognosis, especially in the absence of previous CCT measurements and clinically definite edema. Another prognostic factor—anterior corneal backscatter—also proved to be weakly predictive.

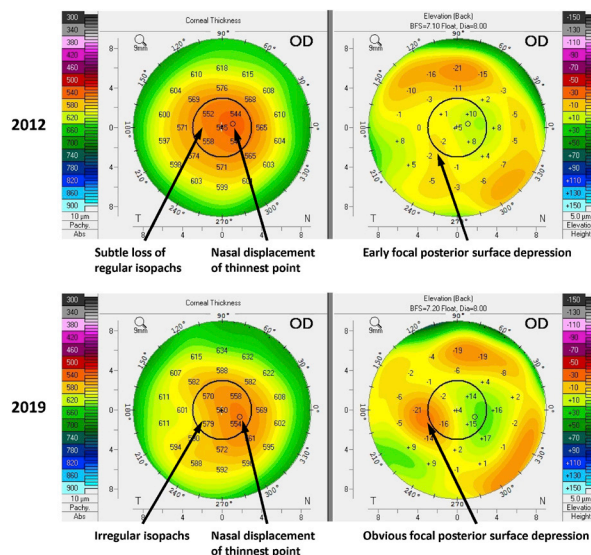
“Clinicians should recognize that Scheimpflug tomography can determine if corneas with FECD might be contributing to visual symptoms, especially in the absence of an advanced cataract, other comorbidity, or clinically obvious edema at the slit lamp,” said Sanjay V. Patel, MD, FRCOphth, at the Mayo Clinic in Rochester, Minnesota. “The images are easy to acquire and interpret in clinical practice, and they help determine prognosis.”

Study specifics. For this study, Dr. Patel and his colleagues used the Pentacam HR (Oculus) to evaluate 56 patients (96 eyes) who had a range of FECD severity. The patients were followed for a median of five years to determine whether imaging findings, anterior corneal backscatter, or CCT could predict disease prognosis. Progression was defined as the new onset of clinically definite edema, a 5% or more increase in CCT, or surgical intervention with endothelial keratoplasty (EK).

Evaluating risk. At five years, when none of the three Scheimpflug parameters were present, the cumulative risk of progression was 7%, reflecting the natural progression of the disease. This increased to 48% when one or two parameters were present and to 89% when all three parameters were present.

Loss of regular isopachs and displacement of the thinnest point of the cornea were independent and clinically important risk factors for progression, conferring an 8- and 4-fold risk of progression, respectively. In contrast, anterior corneal backscatter was a weak predictor of FECD progression/intervention, and CCT was a risk factor only in eyes with definite edema at slit-lamp exam.

Risk after cataract surgery. Researchers also considered the 27 eyes that underwent uncomplicated cataract



FUCHS PROGRESSION. (Left column) Pachymetry maps were evaluated for loss of parallel or almost circular isopachs and for displacement of the thinnest point of the cornea (small circle). (Right column) Posterior elevation maps were evaluated for focal posterior surface depression. All images taken in the same eye.

surgery after enrollment. The four-year cumulative risk of progression/intervention was 0% when no tomographic parameters were present, 50% with one or two parameters, and 75% with all three parameters.

Who should be imaged? Patients who have clinically obvious edema at the slit lamp do not need Scheimpflug imaging, Dr. Patel said. Neither do patients who do *not* appear to have edema and are asymptomatic with normal vision. “For other patients with FECD, or when cataract surgery is being considered, we strongly recommend imaging.”

He suggested that clinicians might use the results to counsel patients about whether EK may be appropriate. He added that the study’s findings might prevent unnecessary EK procedures,

including those undertaken too early in the course of the disease.

A note on CCT cutoffs. “There are published articles that suggest proceeding to keratoplasty above different CCT cutoffs,” Dr. Patel. “I hope that these notions can be abandoned given our findings that CCT was very weakly predictive of prognosis, if at all, whereas the tomographic features were highly predictive.”
—Miriam Karmel

1 Patel SV et al. *Ophthalmology*. Published online Sept. 27, 2019.

Relevant financial disclosures—Dr. Patel: None.

GLAUCOMA

Implantable IOP Sensor May Boost Adherence

AN IMPLANTABLE INTRAOCULAR pressure (IOP) sensor recently earned the European Union’s CE mark after proving safe, well-tolerated, and reliable

in patients with primary open-angle glaucoma.¹ Moreover, evidence suggests that the Eyemate-IO (Implandata Ophthalmic Products) may improve therapeutic intervention and patient compliance.

“There is strong anecdotal evidence—based on patient self-reporting—that the experience of seeing the IOP decrease after eyedrop application leads most patients to be more vigilant in their eyedrop use,” said Lars Choritz, MD, at University Eye Clinic in Magdeburg, Germany.

Designed for indefinite implanta-tion. The Eyemate consists of a foldable sensor ring, which is injected through a clear-corneal incision of at least 3.2 mm and then into the ciliary sulcus during cataract surgery. IOP is recorded on a battery-powered handheld reader that stores up to 3,000 pressure readings.

During a prospective observational study, the sensor was implanted in 22 patients with controlled IOP who were scheduled for cataract surgery. Patients were instructed to measure their IOP

four times daily at self-determined intervals. They averaged 7.9 measures daily. There were few surgical complications and no unexpected adverse events related to the device, which remained in all eyes to the end point at 12 months. Complications occurred early and were attributable to the additional manipulation necessary for device implantation, compared to cataract alone.

Good concordance. Eyemate measurements were 3.2 mm Hg higher than those recorded via Goldmann applanation tonometry, with the difference between the two devices relatively stable over time.

The difference in readings was not unexpected, Dr. Choritz said, as “the Eyemate sensor measures absolute pressure and is unaffected by corneal parameters like central corneal thickness and rigidity.”

And a surprise. IOP variability in each patient surprised the researchers. Whereas conventional tonometry requires the patient to sit upright and still, the Eyemate records pressures

CATARACT

Long-Term Impact of Phakic IOLs in Myopic Eyes

WHILE IMPLANTATION OF AN IRIS-FIXATED PHAKIC IOL provides excellent visual and refractive results in highly myopic adults, researchers have found that older age at time of surgery and age-related axial elongation adversely affected long-term predictability and efficacy.¹ Specifically, increasing axial length (AL) over time, possibly together with cataract formation, resulted in significant myopization. This caused a decrease in both corrected and uncorrected distance visual acuity (CDVA and UDVA).

“Iris-fixated phakic IOLs remain a valid treatment for highly myopic patients,” said Soraya M.R. Jonker, MD, at University Eye Clinic Maastricht in the Netherlands. “But our data show the possibility of axial elongation that should be taken into account” in highly myopic patients who receive one of these IOLs.

What happens after 10 years? The researchers looked for refractive and visual changes in eyes that received one of two types of iris-fixated phakic IOLs from 1998 to 2016—rigid myopic (n = 379) or rigid toric (n = 81). They found mean myopization of -0.79 D, with 52% of eyes within ±1.0 D of target.

In other 10-year findings, the researchers found that

anterior chamber depth did not change over time. However, there was a 1.09% incidence of retinal detachments in these patients, which was higher than that reported in studies with shorter follow-up periods (0.25%-0.39%).

The cataract effect. A subset of 24 eyes that received phakic IOLs—and later underwent explantation and cataract surgery—experienced a significant increase in AL of 0.11 mm per year, or 1.14 mm after 10 years.

After eight years, 10% of the IOLs were explanted because of cataract formation. The higher incidence of eyes requiring cataract surgery in this study is represented by post-op changes in Snellen UDVA lines. At one year postoperatively, UDVA in 51% of eyes was similar or superior to the preoperative CDVA. By the 10-year mark, that number had fallen to 30%.

While cataract formation rates were higher in this cohort than in other studies, the researchers attributed the cataract to older age and longer mean AL rather than to the phakic IOL itself. They stressed that the influence of cataract formation versus AL elongation on myopization remains uncertain.

Patient selection. “Applying our criteria that refractive correction should be stable for two years prior to phakic IOL implantation, patients with known progressive axial elongation (and accompanying refractive change) would not be advised to undergo refractive surgery of any kind,” Dr. Jonker said. “Also, older presbyopic

during real-life activity. As such, it revealed short-term IOP variability within seconds and upon any type of external stimulus. “IOP variability was much greater than expected, with fluctuations as high as 20 mm Hg in many patients,” Dr. Choritz said.

Patients who observed the fluctuations began to experiment on their own to see what happens to their IOP during a range of activities—for example, when drinking coffee or lying down for a nap. Their curiosity appears to have fostered improved adherence, Dr. Choritz said.

“We believe that access to the wealth of data provided by the self-measurements may potentially lead to better individualization of therapy,” he added. “Future studies will show whether the increased frequency of self-measuring leads to better therapy outcomes.”

—Miriam Karmel

1 Choritz L et al. *Am J Ophthalmol*. Published online Sept. 20, 2019.

Relevant financial disclosures—Dr. Choritz: None.

and near-presbyopic patients are not preferred candidates for traditional monofocal phakic IOL implantation, due to their reduced accommodative capacity.”

On the other hand, healthy, near-presbyopic eyes without axial elongation could be candidates for a refractive lens exchange, but doctors should factor in the risk of a retinal detachment in highly myopic eyes.

Dr. Jonker advised refractive surgeons to inform highly myopic patients of the long-term changes in visual outcomes and the possibility of axial elongation over time after phakic IOL implantation. “Changes are likely to be very slow, but they might influence the refractive correction in the long term.”

—Miriam Karmel

1 Jonker SMR et al. *J Cataract Refract Surg*. 2019;45(10):1470-1479.

Relevant financial disclosures—Dr. Jonker: None.

TESTING

Diagnostic Ability of Metagenomic Deep Sequencing Confirmed

IN A SMALL PROOF-OF-CONCEPT

study, researchers at the University of California, San Francisco (UCSF) have confirmed that metagenomic deep sequencing (MDS), which comprehensively samples all genomes in a clinical specimen, can be used to enhance clinicians’ ability to diagnose corneal infections.¹

Study specifics. Researchers in the UCSF lab of Thuy Doan, MD, PhD, set out to compare MDS with standard microbiologic testing for diagnosing corneal, scleral, and conjunctival infections in nine patients. MDS was able to identify all disease-causing organisms, whether they were of parasitic, fungal, bacterial, or viral origin.

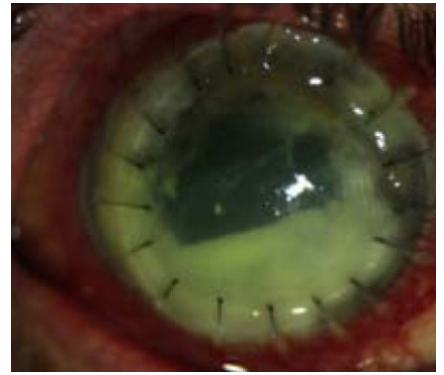
“A traditional culture favors the known organisms; MDS may be better for unexpected or atypical infections,” said Gerami D. Seitzman, MD, at UCSF. “The sequence information can give us not only the name of the organism but also outline its antibiotic susceptibility.”

Barriers to use. “MDS for ocular infections is still in an experimental phase; to use it, you have to be part of a treatment trial. At the present time, there aren’t any CLIAA-certified labs using it as a formal diagnostic test specifically for the eye,” Dr. Seitzman said.

Additional challenges include the following:

Cost. Currently, the researchers said, “the base reagent and sequencing cost of MDS for a single patient (two swabs each) range from \$300 to \$1,000 depending on the extent of parallel library processing and the type of sequencing machine used.”¹

“Overall, MDS will be several times more expensive” than a standard culture, Dr. Seitzman acknowledged. “However, it becomes more cost-effective for treatment-resistant cases—that is, in



UNEXPECTED FINDING. In this patient, MDS detected *Auricoccus indicus*, which is not known to be associated with ocular infections, as well as *Purpureocillium lilacinum*.

cases where the diagnosis is unknown and the disease progresses.” In these instances, she noted, “We often perform numerous repeat cultures.”

Cross-contamination. This may prove to be the biggest challenge to solve. As Dr. Seitzman pointed out, “There is so much DNA in the air or [on surfaces] in a treatment room. MDS is such a sensitive test that may be prone to cross-contamination, even from just talking during the swabbing.”

Bottom line. “As the technology improves, the cost will become lower and our bioinformatic algorithms will continue to improve—and so will our ability to differentiate causative organisms from flora and background,” Dr. Seitzman said.

Eventually, it may be that MDS will not be needed to identify typical community-acquired organisms and will find its greatest benefit at referral centers where more complex or treatment-resistant ocular infections are often seen. That was the instance in this investigation, she noted. “Essentially, this study selected for unusual cases; these patients were previously treated and were referred to us because they were not doing well.”

—Jean Shaw

1 Seitzman GD et al. *Ophthalmology*. 2019;126(12):1724-1726.

Relevant financial disclosures—Dr. Seitzman: None.

See the financial disclosure key, page 10. For full disclosures, including category descriptions, view this News in Review at aao.org/eyenet.