Preoperative screening for occult disease in cataract surgery candidates

A crucial task in the everyday practice of ophthalmology is the assessment of visual potential in a cataract surgery candidate. The most universally practiced means of testing is a complete eye examination that allows the clinician to formulate a qualitative opinion about the degree of concordance between the visual state and the state of the crystalline lens. Are the lens changes consistent with the patient-reported change in vision? Can the lens findings alone account for the absolute level of vision? Is there incongruity between the measured vision and the characteristics of the lens? Identifying other potential ocular abnormalities that can limit visual outcomes after surgery is critical not only for confirming that the cataract is a significant source of visual decline and forecasting the odds of improvement, but also for informing subsequent decisions about intraocular lens (IOL) selection.

Preoperative testing can be stratified into functional and anatomic categories. Functional tests that attempt to establish an absolute measure of visual potential after cataract surgery include corrected visual acuity at distance and near, potential acuity meter measurements, and laser interferometry. Other tests such as brightness acuity and contrast sensitivity testing provide 2 or more datapoints for comparison that estimate the relative visual impact of the lens changes by simulating the contribution of light scatter or low-contrast visual targets to the visual decrement. Absolute and change-based visual function measurements such as these provide complementary information to inform the cataract surgery decision, and it is for this reason that both have been included in the United States Medicare criteria for eligibility for cataract surgery. Functional visual testing and a documented decline in patient activities of daily living are still the most widely used criteria for justifying cataract surgery and for estimating the potential benefit of intervention.

Anatomic assessment has always been a part of preoperative assessment, but rapid advances in ocular imaging technology and more widespread availability of such technology have made routine preoperative anatomic testing a possibility. Corneal topography and tomography are increasingly recognized as fundamental technologies in any cataract surgery practice, not just those with a refractive cataract surgery emphasis. These tools are useful for characterizing regular astigmatism and planning appropriate cornea or lens-based corrections; they are also essential for detecting sources of irregular corneal astigmatism that might limit postoperative visual acuity or adversely affect IOL calculations. The role of posterior corneal astigmatism as a source of error in toric IOL calculations has only recently become a widely appreciated and actionable issue for the cataract surgeon,[1] and the variation in posterior corneal shape as a function of anterior corneal astigmatism and patient age[2] argues for the utility of case-by-case tomographic analysis. While these tools are useful postoperatively for deciphering refractive surprises or lower-than-expected visual acuity outcomes, their greatest potential lies in preventing such issues through either selective or routine use during preoperative evaluation. The value of retinoscopic reflexes, single-mire reflection keratometry, and other readily available "low-tech" diagnostic techniques are still an important and inexpensive means of screening for some of these anterior segment anatomic abnormalities and variations. However, inexpensive does not equate to cost-effective if diagnoses are missed. Since these methods are less direct, less comprehensive, and necessarily less specific means of detecting corneal pathology, their value in a cataract surgery screening setting in 2016 is primarily in indicating the need for further imaging.

The retina is another important imaging target in the context of preoperative assessment. In this issue of the *Journal of Cataract & Refractive Surgery*, 2 original articles address the use of preoperative optical coherence tomography (OCT)–based scanning for screening of macular disease in cataract surgery candidates. In a report from Hirnschall et al. (pages 530–536), the authors retrospectively assessed the sensitivity and specificity of a swept-source OCT-based biometer to identify macular pathology in a series of pre-cataract surgery patients. The biometer captures a 1.0 mm diameter scan of the macula as part of the foveal detection and biometry alignment process. Masked observers were given randomized images and were asked whether each scan was pathological and what pathology was suspected. Same-day full-field images from a dedicated retinal OCT scanner were evaluated in a randomized order and used as the gold standard. In a study sample purposely enriched by selection for presence of macular disease (54% of the 120 eyes), the most common pathology was epiretinal membrane (25% of all eyes), followed by intraretinal fluid (13%),

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drusen (9%), macular hole (4%), and geographic atrophy (4%). Among the 3 reviewers, the biometer-based scans produced a sensitivity between 42% and 68% for detecting the presence of macular pathology and a specificity from 89% to 98%. Sensitivity was higher for macular holes and intraretinal fluid and lower for epiretinal membrane and atrophy. Although overall sensitivity for detecting macular pathology was too low to justify use of the biometer as a solitary screening instrument in its current form, the low false-positive rate is a strength; a device that is already part of the preoperative workflow and has reasonable specificity is likely to go further than a fundus examination alone in detecting some occult macular disease without an unacceptably high burden of false positives.

The previous study was not designed to determine the prevalence of macular disease in a presurgery population. That question is specifically addressed in a prevalence study by Klein et al. (pages 537–541) in a consecutive case series of 265 eyes evaluated for possible multifocal and toric IOL implantation. In this study, patients with evidence of preexisting macular degeneration, macular hole, diabetic retinopathy, retinal vein occlusion, or macula-off retinal detachment were specifically excluded. Occult macular pathology was found on preoperative spectral-domain retinal OCT in 13% of eyes, led by age-related macular degeneration (6%), epiretinal membrane (4%), ischemia secondary to previously undiagnosed retinal vascular pathology (2%), and edema (1%). Significantly higher rates of macular pathology were observed in men, current or former smokers, and those with a history of heart disease. For a patient sample in which known retinal pathology was an exclusion criterion, a 13% rate of occult macular disease in a group of patients being considered for multifocal IOL technology is an important finding. Given the potential for multifocal optics to compound contrast sensitivity problems in the short term and with any progression of disease, detection of signs of macular disease and disease proclivity is an important aim of preoperative assessment.

Corneal and macular pathologies both have the potential to limit a patient's vision after cataract surgery. While questions remain about the cost-effectiveness of routine preoperative screening, preoperative detection of such problems supports more appropriate preoperative management, better surgical decision-making, and potentially better long-term outcomes in patients in whom pathology would otherwise be missed.

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REFERENCES

1. Koch DD, Jenkins RB, Weikert MP, Yeu E, Wang L. Correcting astigmatism with toric intraocular lenses: effect of posterior corneal astigmatism. J Cataract Refract Surg 2013; 39:1803–1809
2. Koch DD, Ali SF, Weikert MP, Shirayama M, Jenkins R, Wang L. Contribution of posterior corneal astigmatism to total corneal astigmatism. J Cataract Refract Surg 2012; 38:2080–2087