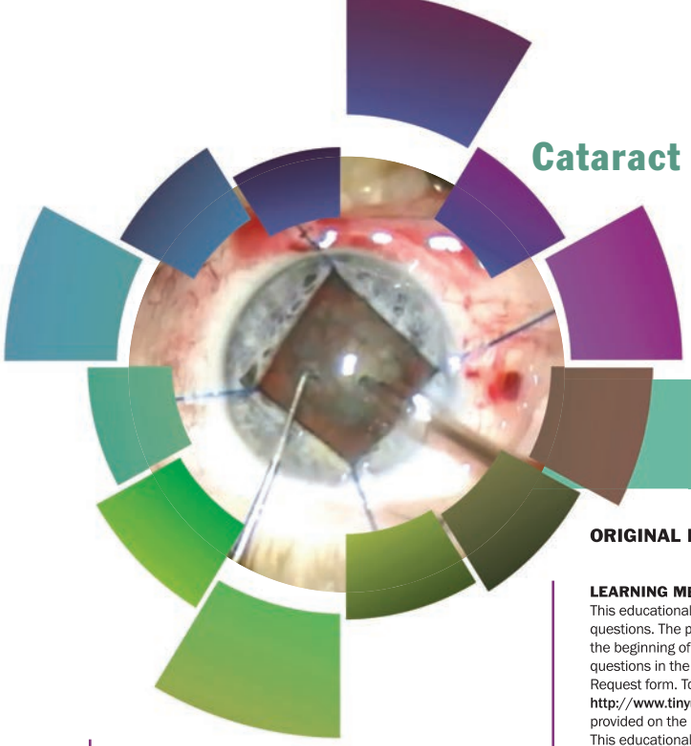

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Cataract Case of the Month CME Series

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This Month's Case

Cataract Surgery in a Patient Who Is Post-Myopic LASIK

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LEARNING METHOD AND MEDIUM
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CONTENT SOURCE
This continuing medical education (CME) activity captures content from an expert roundtable discussion held in San Diego, California, on April 16, 2015.

ACTIVITY DESCRIPTION
Cataract surgery is the most commonly performed surgery among adults in the United States, and the number of patients undergoing this procedure is continuing to increase. For patients who are identified as candidates for cataract surgery, optimization of the ocular surface is critical for obtaining optimal patient outcomes. There are a host of new tools that can help cataract surgeons with their preoperative evaluations. Among these are several tests that are useful adjuncts for diagnosing dry eye/meibomian gland dysfunction. The purpose of this activity is to update ophthalmologists on recent advances in the care of patients with cataracts.

TARGET AUDIENCE
This activity is intended for ophthalmologists.

LEARNING OBJECTIVES
Upon completion of this activity, participants will be better able to:
- Manage preoperative ocular surface conditions with potential to affect surgical outcomes in patients with cataracts
- Demonstrate optimal IOL selection, knowledge of appropriate refractive targets, and understanding of strategies for achieving intended goals
- Discuss risks and benefits of cataract surgery with patients
- Describe the benefits of new diagnostic technologies with application to cataract surgery

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CME Activity

Cataract Surgery in a Patient Who Is Post-Myopic LASIK

John Sheppard, MD, MMSc; Anthony J. Aldave, MD; Deepinder K. Dhaliwal, MD; Bonnie An Henderson, MD; Jay S. Pepose, MD, PhD; William B. Trattler, MD

Case from the files of William B. Trattler, MD

A 67-year-old female with a history of myopic LASIK (laser-assisted in situ keratomileusis) performed 15 years earlier by another surgeon presents with a complaint of reduced vision. She reports being very satisfied with the outcome of her refractive surgery, but says her vision has been deteriorating over the last 2 or 3 years.

Slit-lamp examination shows bilateral cataract that is worse in the left eye (2+ NS). Left eye uncorrected visual acuity (UCVA) is 20/40, best corrected visual acuity (BCVA) is 20/30–2, and manifest refraction is plano +1.00 x 170.

The cornea is clear, but subtle flap striae are visible, and a few punctate epithelial erosions are seen inferiorly with fluorescein staining. Mild meibomian gland dysfunction (MGD) is diagnosed as well, and topography reveals irregular astigmatism (Figure 1). No retinal abnormalities are found on macular ocular coherence tomography (OCT).

The patient is started on loteprednol gel twice daily and topical cyclosporine twice daily for her ocular surface disease (OSD), and returns after 2 weeks. Topography is repeated. Although a different type of system was used (Scheimpflug camera because the Placido disc platform used in the prior examination needed servicing), the imaging shows persistence of irregular astigmatism in the central cornea (Figure 2).

The patient is scheduled for cataract surgery, anticipating that she would derive some benefit in terms of improved BCVA. Preoperative counseling, however, included a discussion about the uncertainty of her vision outcome due to the inability to know exactly how much her vision was affected by her cornea irregularity.

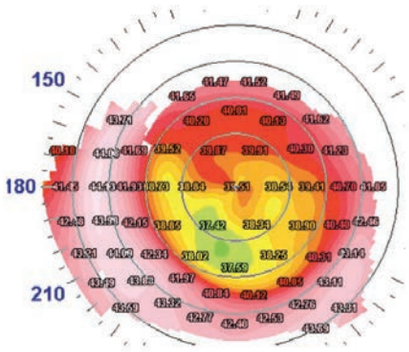

Figure 1. Preoperative topography of a 67-year-old female 15 years after myopic LASIK shows irregular astigmatism.

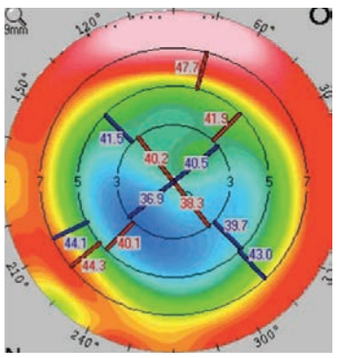

Figure 2. Topography showing irregular astigmatism at 2 weeks after initiating treatment for OSD.

Images Courtesy of William B. Trattler, MD

She undergoes uncomplicated cataract surgery with implantation of an aspheric monofocal intraocular lens (IOL) (Figure 3). At her 1-month visit, the patient is unhappy with her vision. On examination, UCVA is 20/50-, BCVA is 20/30, and MR is +1.50 +1.00 x 165. She has persistence of mild punctate epithelial erosions and 1+ posterior capsule opacification.

Treatment for OSD, which included another pulse of loteprednol gel twice daily for 3 weeks and topical cyclosporine, was resumed, and Nd:YAG laser capsulotomy was performed. One month later, the patient remains unhappy and describes her vision as worse than before cataract surgery; UCVA is 20/50. She says she now needs glasses for distance, and she reports poorer quality of vision.

PREOPERATIVE EXAMINATION

Ocular surface disease is a common finding in the cataract surgery population and needs to be addressed preoperatively because it affects the accuracy of the keratometry measurements used for IOL calculation as well as the quality of vision after surgery.

In addition to the findings from a careful clinical examination for dry eye, which would include lid evaluation and expression, fluorescein and lissamine green staining, and tear film break-up time, the findings of irregular astigmatism on topography and drop-out of the mires on Placido disc topography are clues to the presence of dry eye disease. The follow-up topography that was performed preoperatively in this patient was done with the Scheimpflug imaging system that enables detection of irregular astigmatism due to a misshaped cornea, but it does not pick up irregularities from OSD. Therefore, it was assumed that her persistent irregular astigmatism was due to the flap striae and corneal remodeling over time, but not to a suboptimal ocular surface, therefore justifying the decision to proceed with surgery. The flap-related irregular astigmatism also explains why she did not have a better postoperative visual outcome. Over-refraction with a rigid gas permeable (RGP) contact lens may have been helpful preoperatively to assess how the corneal irregularity was affecting her vision and how much improvement might be expected after cataract surgery.

A comprehensive preoperative examination should also include assessment for posterior segment pathology. As a minimum standard of care, patients should undergo a dilated fundus examination. However, macular OCT can help with detection of subtle pathology *[see Sidebar: Macular OCT Prior to Cataract Surgery]*.

Macular OCT Prior to Cataract Surgery

William B. Trattler, MD

Identification of preexisting retinal pathology is essential when undertaking cataract surgery because it influences visual potential, quality of vision, and risk for postoperative cystoid macular edema (CME). Macular OCT is a valuable aid for retina evaluation, considering that visualization of the posterior segment may be limited when looking through the cataract.

The potential for overlooking existing pathology using direct examination alone in eyes of cataract surgery patients was demonstrated in a study comparing findings of preoperative and postoperative retinal photographs.[1] The investigators identified epiretinal membrane in 3.1% of eyes before surgery and in 14.8% at 1 month after the procedure; there was low agreement between the findings of the 2 diagnostic examinations.

Anecdotally, I have been impressed by my experience using preoperative OCT that has allowed me to identify unsuspected retinal pathology. Therefore, I routinely perform macular OCT preoperatively in all cataract surgery patients. Because this is a screening procedure, it is not billable to insurance, and the imaging is done without charging the patient. If any pathology is identified, charges for subsequent OCT examination can be submitted for insurance reimbursement.

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A

AL: 25.41 mm (SNR = 509.4)
K1: 38.70 D / 8.72 mm @ 36°
K2: 39.38 D / 8.57 mm @ 126°
R/SE: 8.64 mm / 39.04 D
Cyl.: 0.68 D @ 126°
ACD: 3.59 mm
Status: Phakic

OS left

Tecnis MF1 ONE ZMB00		TORIC-SN6AT		Tecnis MultiFocal ZMB00 1pc		Tecnis MultiFocal ZMA00 3pc	
A const: 119.30		**A const:** 119.10		**A0 const:** 1.508 **A1 const:** 0.400 **A2 const:** 0.100		**A0 const:** 1.375 **A1 const:** 0.400 **A2 const:** 0.100	
IOL (D)	**REF (D)**	**IOL (D)**	**REF (D)**	**IOL (D)**	**REF (D)**	**IOL (D)**	**REF (D)**
23.5	−2.16	23.0	−1.96	26.0	−2.21	25.5	−2.03
23.0	−1.78	22.5	−1.57	25.5	−1.82	25.0	−1.65
22.5	−1.40	22.0	−1.20	25.0	−1.44	24.5	−1.27
22.0	**−1.03**	**21.5**	**−0.82**	**24.5**	**−1.07**	**24.0**	**−0.90**
21.5	−0.66	21.0	−0.46	24.0	−0.70	23.5	−0.52
21.0	−0.30	20.5	−0.09	23.5	−0.34	23.0	−0.16
20.5	0.06	20.0	0.27	23.0	0.02	22.5	0.20
Emme. IOL: 20.59		**Emme. IOL:** 20.37		**Emme. IOL:** 23.03		**Emme. IOL:** 22.78	

B

IOL Calculator for Eyes with Prior Myopic LASIK/PRK
(Your data will not be saved. Please print a copy for your records.)

Please enter all data available and press "Calculate"

Doctor Name: William Trattler | Patient Name: Post- LASIK Left Eye | Eye: OS | IOL Model: ZCB00 | Target Ref (D): -0.50

[2]Adjusted Atlas 9000 (4mm zone)	-	[2]Shammas	24.14 D
[1]Adjusted Atlas Ring Values	-	[3]Haigis-L	23.73 D
Masket Formula	-	[3]Galilei	-
Modified-Masket	-	[2]Potvin-Hill Pentacam	-
[1]Adjusted ACCP/ACP/APP	-	[4]OCT	-
Barrett True K	-	[5]Barrett True K No History	23.43 D

Figure 3. IOL power selection planning. **[A]** Note that the Tecnis monofocal ZCB00 and the Tecnis multifocal ZMB00 have the same A-constant: 119.3. **[B]** The Haigis-L for myopia suggests the 23.5 D 1-piece aspheric hydrophobic acrylic IOL will result in a postoperative refractive error of −0.34 D. The ASCRS (American Society of Cataract and Refractive Surgery) Post Keratorefractive On-Line Calculator supports using this IOL power.

PREOPERATIVE OSD MANAGEMENT

Treatment for OSD is guided by the underlying cause and the desired timing for resolution. This patient presented with MGD, which is the most common cause of evaporative dry eye disease.[1] Treatment for patients with minimal to mild MGD includes lid hygiene, topical azithromycin, artificial lubricants, and consideration of an oral tetracycline.[2] Anti-inflammatory treatment may be indicated for managing dry eye in patients with moderate MGD.[2]

The conventional lid hygiene method consists of application of warm compresses with lid massage. Historically, a mild baby shampoo has been suggested as a cleanser; however, there is a lack of quality evidence to support use of baby shampoo. In theory, it may be detrimental because its detergent action can cause further breakdown of the already compromised lipid layer.

A number of products have been developed specifically as lid cleansers for patients with MGD. They vary in price, ingredients, and, anecdotally, in their likelihood to cause stinging. Although there also is a lack of evidence demonstrating that these products are superior to warm compresses with lid massage, they may be associated with higher patient acceptance on the basis of such factors as convenience of use and pleasing aesthetics. As a result, patients may be more likely to comply with their lid cleansing regimen, which would translate into better efficacy. With compliance in mind and knowing that simplicity of the regimen is important, it is reasonable to instruct patients to perform lid hygiene once or twice a day. Devices designed for in-office use to treat MGD by relieving gland obstruction are also available (**http://tinyurl.com/EyeOnCataract-1PDF**). [See Cataract Case of the Month, "A Patient With Mixed Aqueous Deficiency/Evaporative Dry Eye Disease" in the September issue of *Ophthalmology Times*.] These treatments are not covered by insurance, and so out-of-pocket cost may be an issue limiting their use.

When patients require ocular surface optimization and are eager to have surgery as soon as possible, treatment with a topical corticosteroid combined with punctal plugs will allow for more rapid control of inflammation. If long-term anti-inflammatory control is anticipated—and surgery can be delayed for several months so that an immediate "fix" is not needed—topical cyclosporine can be initiated along with preservative-free artificial tears. With this regimen, punctal plug placement should be withheld for 4 to 6 weeks so that the ocular surface is not exposed to a tear film full of inflammatory mediators. Initiating a topical corticosteroid prior to or concomitantly with the topical cyclosporine would hasten resolution of the inflammation, allow earlier placement of the punctal plugs, mitigate cyclosporine-induced burning and stinging, and provide faster improvement of dry eye-related symptoms.[3,4]

IOL DECISIONS IN THE POST-LASIK PATIENT

Power calculation. Accurate IOL power calculation is challenging in the post-LASIK eye because the laser ablation affects corneal power. Multiple methods have been introduced to better determine the true corneal power after LASIK, and numerous formulas have been suggested for calculating IOL power in these cases. None of the approaches is perfect, although some formulas seem to perform better than others in patients who have had myopic refractive surgery.[5,6]

Individual surgeons may have a preference for a particular formula or, if not, they can use various online systems, such as the postrefractive IOL calculator (iolcalc.org) or the Hoffer/Savini LASIK IOL Power Tool (https://www.iolpowerclub.org/post-surgical-iol-calc) in which IOL power calculations are performed using all available data and multiple formulas. Intraoperative aberrometry offers another option for refining IOL power selection in these challenging postrefractive surgery cases, and 2 groups have reported positive results.[5,7] Ultimately, however, the surgeon needs to apply clinical judgment, given that the programs generally suggest a range of powers.

Spherical aberration. IOL asphericity is another issue to consider in the postkeratorefractive surgery eye. In general, an IOL with negative spherical aberration is preferred in a post-myopic LASIK eye because the surgery likely induced some positive spherical aberration. In contrast, a spherical IOL or one with zero spherical aberration would be appropriate for a posthyperopic LASIK eye that likely has negative spherical aberration. An argument can also be made to favor an IOL with zero spherical aberration in all postkeratorefractive surgery patients according to the reasoning that image quality with that optic design is less sensitive to decentration and tilt. Its use may minimize the potential for disabling coma-related vision problems. A decentered aspheric IOL can, however, induce coma that can be associated with persistent ghosting.[8] Even though a conventional IOL that has positive spherical aberration reduces contrast sensitivity, consequences of its use may be modest in older patients because these individuals have smaller pupils.

The choice between an aspheric, aberration-neutral and a spherical IOL can be individualized by measuring the actual amount of corneal spherical aberration. This information is directly available on some topographers or aberrometers. It is available directly on some topography systems and on some combined topography/aberrometry systems.

Presbyopic correction. Postrefractive surgery patients, in particular, might desire reduced spectacle dependence after cataract surgery and be interested in a presbyopia-correcting IOL. Surgeons should, however, proceed cautiously with implanting a multifocal IOL in any patient who has had a higher level of myopic correction (≥–6 to –7 D) because it is likely to have introduced some multifocality of the cornea that would limit good-quality vision. An accommodating IOL with zero spherical aberration might be a better choice for these patients.

REFLECTIONS ON THE CASE

With her history of keratorefractive surgery and the presence of both irregular corneal astigmatism and OSD, this patient presented several challenges for achieving a good visual outcome after cataract surgery. Her case illustrates the importance of a comprehensive preoperative examination: to identify issues that can compromise the accuracy of the surgical result and postoperative quality of vision, to promote aggressive management of any treatable conditions, and to allow for a thorough informed consent discussion to set appropriate expectations.

Perhaps this patient may have had a better outcome if she had been implanted with a zero spherical aberration IOL, but she likely still would have had significant complaints because such a lens would not have addressed her uncorrected irregular astigmatism, which appears to be the main cause for her less-than-satisfactory outcome.

A wavefront analysis might be performed to evaluate the potential influence of higher-order aberrations on the quality of vision. Because pupil diameter influences ocular higher-order aberrations,[9] topical 1% pilocarpine or 0.2% brimonidine might be tried in this patient to see if pupil constriction improves her vision.

An RGP lens can also be offered noting that a larger scleral RGP lens is a more comfortable option than a traditional RGP lens. Even if patients with irregular astigmatism decline RGP wear, a trial in the office demonstrating they have potential for good vision may have psychological value for these individuals and further establish that their decreased vision is due to preexisting cornea irregularity and is not a complication of the cataract surgery.

SUMMARY

Various strategies exist to improve refractive accuracy and maximize postoperative vision in patients with a history of keratorefractive surgery. Even under the best of circumstances, however, cataract surgeons face challenges in delivering optimal outcomes. Extensive patient counseling is needed in these cases, and surgeons should carefully document all the information in both the chart and the written informed consent.

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