

# CATARACT SURGERY IN PATIENTS AFTER HIGH MYOPIC LASIK

SURGEONS SHARE THEIR APPROACHES TO TREATING THESE CHALLENGING PATIENTS.

BY DANIEL H. CHANG, MD; MICHAEL LAWLESS, MBBS, FRANZCO, FRACS; AND TAL RAVIV, MD



DANIEL H. CHANG, MD

## A Two-by-Two Square Approach to High Myopic LASIK Patients

The difficulties encountered in cataract surgery for patients who have previously undergone LASIK for high myopia are twofold, as these patients have two complicating factors: high myopia *and* a post-LASIK cornea. Both high myopia and post-LASIK patients present their own sets of difficulties when it comes to IOL power calculations and the cataract surgery itself. These factors make nailing the IOL power calculations difficult and require certain considerations of the patient's eye anatomy to be taken into account during the surgical procedure.

### WHERE TO START

For patients presenting with both high myopia and a history of LASIK, I start by thinking about each complicating factor individually. I address separately any issues stemming from the patient's high myopia and then from the patient's previous LASIK. I then evaluate the factors together because this one patient is presenting with both complicating conditions.

A patient with high myopia who has also had LASIK still has the anatomy of high myopia, even though he or she no longer has the refractive

error of high myopia. This introduces several complicating factors, including axial length measurement errors, IOL power calculation formula errors, intraoperative reverse pupillary block, and greater corneal and scleral elasticity.

Eyes with previous LASIK introduce *less* difficulty surgically, but special precautions should still be taken. In particular, it is important not to disturb the flap during cataract surgery. When it comes to IOL power calculations, on the other hand, post-LASIK eyes can be quite challenging.

### IOL POWER CALCULATIONS

**Patients with high myopia.** Optical biometry makes certain assumptions that may not be accurate when measuring eyes with long axial lengths, resulting in power calculation errors.<sup>1</sup> There are, however, several formulas and adjustments that can correct for this, and debate exists as to which formula is the best for a given patient.

In a 2015 study, Abulafia et al compared the predicted refractions calculated using various formulas (Holladay 1, SRK/T, Hoffer Q, and Haigis) with postoperative refraction

results in myopic eyes with axial length greater than 26 mm.<sup>2</sup> Participants were split into two groups (A and B) based on IOL dioptric power. Group A included patients in whom the IOL was 6.00 D or more, and group B included patients in whom the IOL was less than 6.00 D. The study authors found that, in group A, the SRK/T, Hoffer Q, Haigis, Barrett Universal II, Holladay 2, and Olsen formulas met the benchmark criteria of having a prediction error of  $\pm 0.50$  D in at least 71% of eyes and  $\pm 1.00$  D in 93% of eyes. In group B, only the Barrett Universal II formula and the Holladay 1 and Haigis formulas using the axial length-adjusted method met those criteria.

My go-to formula—for all eyes, both long and short—is the Barrett Universal II. I like it because it can be used for all axial lengths with no adjustments. It is included on the biometer I use, the IOLMaster 700 (Carl Zeiss Meditec). Utilizing the multiformula printout, I also look at the SRK-T and Holladay 2 calculations, but I primarily focus on the Barrett Universal II calculations.

**Post-LASIK patients.** Getting the IOL power right is difficult in patients with previous corneal refractive

surgery, and whenever something is challenging, patient counseling becomes all the more important. It is especially important to inform patients who had LASIK to get out of spectacles that their refractive outcome after cataract surgery can be challenging. This will allow these patients to set their expectations appropriately. If patients are opting for presbyopia correction, we should disclose that they have a higher chance of requiring an enhancement. Thankfully, because these patients have already had refractive surgery, they are generally okay with that possibility.

Calculating IOL power in patients who have had LASIK is difficult, regardless of any previous refractive error. The difficulty stems from the alteration of both the anterior corneal curvature and the ratio of the anterior and posterior corneal curvatures during the LASIK procedure, which cause errors in determining effective lens positioning by most IOL power calculation formulas.

Much has been written about IOL power calculation in post-LASIK eyes, but the simplest approach to account for previous refractive surgery in these patients is to use the postrefractive calculator on the ASCRS website. Alternatively, the Barrett True-K formula was specifically created for post-LASIK calculations. Some devices,

such as the IOLMaster 700, are now capable of measuring total corneal power, although the associated formulas are still being validated for use in post-LASIK eyes.

### **CATARACT SURGERY**

#### **Patients with high myopia.**

Two factors must be considered when performing cataract surgery in patients with high myopia. First, fluid shifts—in which the irrigating fluid pushes the lens-iris diaphragm backward and creates a high amount of pressure in the anterior chamber—may occur. This causes a very deep anterior chamber and significant patient discomfort; however, the pupillary block can be easily released by lifting the iris and irrigating behind it.

Another factor to consider during cataract surgery on highly myopic eyes is the elasticity of the cornea and sclera. As the eye wall tends to be more elastic, extreme care must be taken when making your incision and when making sure that the wounds are sealed appropriately. If they are not properly sealed, the wounds may leak, which causes the eyes to become hypotonous and increase the risk of IOL malpositioning and even endophthalmitis.

Due to the increased axial lengths of highly myopic eyes, these factors will be present in emmetropic patients with previous high myopia even if they had

LASIK to correct the refractive effects of their high myopia.

**Patients who have had LASIK.** The main anatomic factor to consider during cataract surgery in a patient who has previously had LASIK is the flap. Simply put, do not disturb the flap. Make your wounds peripheral to the flap and be especially mindful during stromal hydration to seal the wound at the end of the procedure. Be sure not to inject fluid into the flap interface and lift the flap. Surgery on a post-LASIK patient is typically not difficult—nailing the IOL power is the challenge.

### **A WELCOME CHALLENGE**

Patients with previous high myopic LASIK present a uniquely difficult challenge for us as surgeons. These patients have not just one but two complicating factors in cataract surgery. Therefore, they require increased time, care, and communication to ensure that optimum outcomes and patient satisfaction are achieved. The two-by-two square approach described here may be helpful in addressing these types of patients.

1. Wang L, Shirayama M, Ma XJ, Kohnen T, Koch DD. Optimizing intraocular lens power calculations in eyes with axial lengths above 25.0 mm. *J Cataract Refract Surg.* 2011;37:2018–2027.  
2. Abulafia A, Barrett GD, Rotenberg M, et al. Intraocular lens power calculation for eyes with an axial length greater than 26.0 mm: Comparison of formulas and methods. *J Cataract Refract Surg.* 2015;41:548–556.



**MICHAEL LAWLESS, MBBS, FRANZCO, FRACS**

## Five-Step Approach to Patients After High Myopic LASIK

Patients who arrive for cataract surgery years after myopic LASIK are a particular challenge. They have desired and have mostly achieved spectacle independence, and some may have experienced monovision. I approach these patients using the following five steps.

### **STEP NO. 1: CHECK THE ANATOMY**

Not all myopic LASIK patients are the same. A patient with a refractive error of -6.00 D is different from a patient with a -12.00 D refractive error, and a patient operated on in 1995 will have a different corneal profile than a patient operated on in 2010. Therefore,

close examination of the corneal anatomy is needed. In particular, I like to look at the corneal higher-order aberration (HOA) profile. I use the Peramis (Schwind eye-tech-solutions) device to look at corneal HOAs over 6 mm. If the HOA total is greater than 0.50 D or coma is greater than 0.35 D

## ► ACHIEVING PREMIUM RESULTS WITH PREMIUM IOLS

in a high myopic LASIK patient, I use a monofocal or toric monofocal IOL. I exclude these patients from trifocal lenses because of concern about increased photic phenomena. It doesn't have to be the HOA profile, but the important aspect is that some objective measure of the quality of the central 4 to 6 mm of cornea—what I call the *visually relevant corneal topography*—is evaluated.

### **STEP NO. 2: SET PATIENT EXPECTATIONS**

Using the Barrett True K Formula with posterior corneal curvature as measured on the IOLMaster 700, I have been achieving  $\pm 0.50$  D of accuracy in both sphere and cylinder in 80% of high myopic LASIK eyes (personal data). This is not as high as my benchmark for normal eyes, and it means that one in five patients will not achieve the intended target. This reality must be covered in the preoperative discussion with the patient, particularly if a trifocal lens is used.

### **STEP NO. 3: PLAN FOR ENHANCEMENT**

Given that one in five high myopic LASIK patients will not achieve their target in cataract surgery, I plan ahead regarding possibilities for enhancement. Generally, enhancement for these patients will be surface PRK or a secondary IOL. This must also be built into the discussion with the patient prior to surgery so that there are no surprises.

### **STEP NO. 4: TALK POSTERIOR SEGMENT**

Often, patients with high myopia have already had posterior vitreous detachments. If they have not, I talk to them about the possibility that surgery could induce a posterior vitreous detachment and the significance thereof.

### **STEP NO. 5: WATCH OUT FOR MONOVISION**

Occasionally, high myopic patients had monovision LASIK in their 40s. This can be a trap. A 45-year-old patient who was highly myopic and, after LASIK, is now plano in the dominant eye and  $-1.50$  D in the nondominant eye often functions very well. When patients such as these, now 65 years old, hear you discuss the outcomes after cataract surgery, they may think that, if they end up plano and  $-1.50$  D, it will be the same as when they were 45 years old. It will not. At that age, they had accommodative ability in both eyes, which gave better intermediate to near vision than what is possible with monovision with monofocal IOLs. It is important to give these patients a reality check and help them to set realistic expectations before surgery.

### **CONCLUSION**

Overall, I find cataract patients with previous high myopic LASIK to be challenging but enjoyable. I can work with them throughout the process, and they have a good understanding of risk and reward, given their previous LASIK experience, compared with patients who have never had LASIK.



TAL RAVIV, MD

## My Approach to Cataract in the High Myopic LASIK Patient

As refractive cataract surgery continues its refinement toward LASIK-like outcomes, there are some scenarios in which our targeted refractive accuracy, or percentage of eyes within  $\pm 0.50$  D, still falls short. High myopia and previous refractive surgery are two such categories, and, when combined in one patient, they can create refractive accuracy challenges.

In this article, I break down the surgical challenges in these patients and the challenges in refractive IOL planning in this scenario, specifically with presbyopia-correcting IOLs.

### MANAGE PATIENT EXPECTATIONS

Many high myopic LASIK patients were early adopters of refractive surgery and had their LASIK some 2 decades ago. They are highly motivated to retain or restore their spectacle independence—which many have lost due to presbyopia and cataract—to how it was right after their LASIK.

As part of the refractive workup, I elicit these patients' spectacle and contact lens history. After LASIK, did they need reading glasses? Did they have monovision at some point? Did they return to wearing contact lenses or glasses for certain tasks? Do they despise reading glasses? Do they despise all glasses?

### MY IOL PREFERENCES

I shied away from placing earlier-generation multifocal IOLs in post-LASIK eyes; I preferred accommodating IOLs with a mini-monovision strategy. With modern lenses now available, I frequently recommend either a low-add multifocal or an extended depth of focus (EDOF) IOL in these patients.

All high myopic LASIK treatments induce some corneal HOAs, including positive spherical aberration. Also, our refractive accuracy has a higher standard deviation in these eyes. I find that either a monofocal or EDOF IOL (or the toric versions of these models) is most forgiving of slight refractive misses. I therefore favor that approach, usually in the nondominant (or near-vision) eye first.

### BIOMETRY

It's imperative to use the latest biometric devices and IOL formulas in these eyes. Published data back up the Barrett True K formula, which uses the Barrett Universal II as its base and accounts for long axial length adjustments. I also use intraoperative aberrometry to fine-tune IOL power.

Most important, I discuss with patients the likelihood of needing a touch-up procedure. Because repeat LASIK is usually not a great option in these eyes with typically thin corneas, IOL exchange or rotation is the more likely route for enhancement. If weak zonules or other surgical complexities preclude IOL exchange, then a piggyback IOL or PRK on top of the flap would be alternative options. Piggyback IOLs carry the risk of pigment liberation, but that is less likely in these long eyes.

### RETINA REFERRAL

All axial myopes face higher lifetime risk for retinal detachment, and cataract surgery may slightly raise that risk. I typically have these patients cleared by a retina colleague preoperatively and seen again in the early postoperative period. This allows pretreatment of any risky areas and allows the patient to have an established relationship with the retina practice should it ever become necessary.

### SURGERY CONSIDERATIONS

In surgery, the surgeon should be familiar with avoiding lens-diaphragm retropulsion syndrome, a common intraoperative deepening of the chamber that can be broken by elevating the iris edge. A supracapsular technique can be useful in long eyes, as the large anterior chambers afford room for nucleus manipulation. Finally, I take precaution to avoid sudden decompression of the eye on instrument withdrawal, injecting added OVD through the sideport prior to phacoemulsification or cortical I/A.

### MEETING THE CHALLENGE

It's wonderful to be able to offer these most challenging patients our most advanced IOLs and the great visual results they bring. ■

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