

Assessing Post-RK Eyes

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How do you determine the keratometric value and calculate IOL power in eyes with previous RK?

STEVEN J. DELL, MD

The normal assumptions regarding true central corneal curvature do not apply to eyes with previous RK. The keratometric values, as determined by manual keratometry or the IOLMaster (Carl Zeiss Meditec, Inc., Dublin, CA), are measured at a 3.2- or 2.5-mm zone, respectively. The true central corneal power may be much flatter than expected in these eyes. I typically attempt to determine the central corneal power by measuring the cornea in two ways: (1) averaging the 0- and 2-mm mean corneal power from the numeric map of the Humphrey Atlas Topographer (Carl Zeiss Meditec, Inc.) and (2) taking the flattest keratometric values from the IOLMaster. I will select the method that gives flatter values, which is almost always the Humphrey Atlas. To achieve emmetropia, I typically target -0.40 D in the case of a previous four-incision RK, -0.65 D after an eight-incision RK, and -0.75 D after a 16-incision RK. Due to midperipheral corneal edema, the refraction in these eyes may be significantly hyperopic for several weeks before shifting toward emmetropia.

DOUGLAS D. KOCH, MD

My colleagues and I find eyes with previous RK to be the most difficult in which to accurately estimate corneal refractive power. This is due to the wide range of powers of the anterior cornea and unpredictable—but now measurable—changes in the posterior surface. We obtain multiple topographic measurements (typically with three different devices) and enter these values into the ASCRS postrefractive surgery IOL calculator. Recently, we have found in preliminary studies that the Galilei Double Scheimpflug Analyzer (Ziemer Group, Port, Switzerland), with its combined Placido and dual Scheimpflug imaging, may provide the most accurate corneal power values

(unpublished data). We use total corneal power but are exploring other values in ongoing studies.

RICHARD J. MACKOOL, MD

I currently use a method proposed by Paul Ernest, MD, that employs the flattest keratometric reading visible on the topographic map to calculate IOL power. All patients are informed that the final refractive result will not be known for 2 months and that a refractive procedure or IOL exchange may be required. In anticipation of an IOL exchange, I remove lens epithelium from the under surface of the anterior capsule during the procedure. This greatly reduces the rate and severity of postoperative adherence of the capsule to the optic.

SAMUEL MASKET, MD

The calculation of IOL power after RK surgery is compromised by diurnal fluctuation in corneal curvature (the cornea is flatter following sleep and becomes steeper as the day progresses), by progressive corneal flattening over long periods of time, and by the inability to measure true central corneal power with traditional keratometry. Additionally, I have found that the number of previous RK incisions affects IOL power outcomes. I therefore proceed as follows.

First, I obtain keratometric readings by topography and estimate central corneal power. Additionally, I obtain simulated keratometry topographic readings, automated keratometry readings, and measurements with the IOLMaster (which reads a small, 2.5-mm optical zone). I use the flattest keratometric reading from all sources for the IOL power calculation. Patients are scheduled to come to the office at a specific time of day for their measurements. For example, if a patient reads considerably more in the afternoon compared with other times of day, and he or she wishes to have corresponding vision at that time of day, measurements are taken in the afternoon.

Second, using the IOLMaster, I look at the Haigis and SRK-T formulas. Alternatively, one may use the Holladay II formula and click prior RK.

Third, for eyes with four previous RK incisions, I add 0.50 to 0.75 D to the calculated IOL power. For eyes with six to eight RK cuts, I add 1.00 D to the IOL power. For eyes with 16 prior cuts, I add 2.00 D to the calculated IOL power. Even with this approach, I find it is hard to overcorrect and obtain a myopic outcome.

Fourth, during surgery, I avoid high IOP (lower the bottle) and any maneuver that might stress the prior incisions in order to have the corneal curvature recover as soon as possible after surgery. The optical results of surgery may reveal significant hyperopia in the early postoperative period, as the unstable cornea flattens transiently. I follow keratometric readings as a guide to know when stability is reached; this may take weeks to months, varying with the number of previous incisions and how the cornea reacts to cataract surgery. Only when keratometric values return to their preoperative readings do I deem the optical results stable. Enhancements may be considered at this time.

Fifth, I avoid prior RK/astigmatic keratotomy incisions at all costs. Finally and most importantly, I share all of this information with the patient during the preoperative consultation so he or she knows what to expect.

MITCHELL C. SHULTZ, MD

When a patient with previous RK presents to me for a consultation for cataract surgery, I make it extremely clear from the outset that he or she may require a tune-up after the procedure. Most of these patients expect to be spectacle independent after surgery, and many are demanding accommodating or multifocal technologies. In these cases, I generally rely on topographic keratometric values, and I look for the flattest values on the 3-mm keratometric maps. I then use the Haigis L formula, which does not rely on preoperative refractive data. If refractive data from before the RK procedure are available, I will choose my IOL power based on the modified Masket IOL formula. Generally, this technique will achieve within 1.00 D of the planned refractive outcome. For patients in whom I implant a multifocal IOL, a LASIK adjustment after cataract surgery is often required to manage astigmatism, because intraoperative limbal relaxing incisions are not recommended in these individuals. Finally, if the patient's central keratometric values are less than 37.00 D, I will intentionally aim for a postoperative spherical equivalent of +1.00 D, as I prefer to steepen the cornea with LASIK to improve corneal sphericity after surgery and reduce the risk of requiring a myopic ablation that could further diminish quality of vision related to negative sphericity.

J. TREVOR WOODHAMS, MD

My colleagues and I measure the keratometric values at 2 mm and then use the Holladay Equivalent Keratometry

method to calculate the IOL power for eyes with previous RK. This method is used for adjusting the measurement of corneal keratometry in eyes that have had previous keratorefractive surgery. The Holladay Equivalent Keratometry method adjusts the effective lens position to account for the surgically altered corneal topography (ie, double K method). We have conducted retrospective outcomes analysis and applied a first-order regression formula to the results. This prompted us to make a further 1.35 D adjustment to the calculated IOL power. That is, if this adjustment had been made to all the RK eyes operated upon, the results would have been a best-fit straight line on the attempted versus achieved graph. ■

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