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IOL Calculations following Radial Keratotomy Surgery

Q: A 50-year-old man who was −7.00 OU had radial keratotomy OU with a residual myopia of −1.00 diopters in both eyes. His original "K" readings were 43.00/43.00. His present K readings are 41.00/41.00. Eight years later, he developed bilateral posterior subcapsular cataracts (not related to the refractive surgery) which needed removal. How would you go about determining the power of the intraocular lens to achieve a postoperative correction of −1.00?

The problem with intraocular lens (IOL) calculations following keratorefractive procedures is our inability to measure accurately the stabilized postoperative power of the cornea. This case is a perfect example in which there was a 6 diopter reduction in the myopia and only a 2 D reduction in the K readings.

There are two methods of arriving at the *effective* corneal power. The simplest method is to take the change in refraction at the corneal plane that resulted from the keratorefractive surgery and subtract this value from the average value of the initial K readings. If the refractions were performed at a vertex distance of 12 mm in this patient, the preoperative refraction would be −6.46 D at the corneal plane and the postoperative refraction would be −.99 D. The change in refraction (reduction of the myopia) at the corneal plane would be 5.47 D. Notice that a .53 D error would have been made if vertex considerations were ignored.

Reducing the average preoperative K readings of 43.00 D by 5.47 D would result in an *effective* corneal power of 37.53 D, substantially less than those measured on a standard keratometer. The 37.53 D would then be the *effective* K reading used in the IOL calculation. Care must be taken to use a second generation intraocular lens formula,[1] since these eyes are very unusual and earlier formulas can result in large errors even when the measurements are correct.

The second method for determining the *effective* corneal power requires use of a plano hard contact lens. The underlying principle is that a plano hard contact lens neutralizes the corneal power and replaces it with the base curve power of the contact lens. For example, if a plano hard contact lens with a base curve of 37.50 D was placed on this patient, his refraction would still be −1 D if the corneal power were truly 37.53 D as we determined from the refraction change. In contrast, if he became −2 D with this contact lens, it means that the base curve of the lens is 1 D stronger than the cornea. Therefore, the cornea must be ~~38.50 D.~~ 36.50 D.

Obviously, this second method requires a refraction over the contact lens in a patient with a cataract and the accuracy is no better than the refraction. If the cataract is fairly dense, then the accuracy diminishes and the first method becomes more reliable. When these situations occur in our practice, both methods are employed since each have limitations.

One final note; do not be concerned if the patient is much more hyperopic than expected in the first few days after the cataract surgery, since the keratorefractive incisions usually reopen as if the keratorefractive procedure had just been performed. The postoperative change in the cornea usually parallels the changes that occurred after the initial keratorefractive procedure and can be used to forecast the stabilization period following the cataract surgery..

References

1. Holladay JT, et al: A three-part system for refining intraocular lens power calculations. *Journal of Cataract and Refractive Surgery* 1988; 13:17-24.

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