Guidelines for IOL power calculations following corneal refractive surgery procedures started to surface in the early 2000s, after surgeons began to realize that surgically induced changes in corneal shape altered the relationship between total corneal power and anterior and posterior corneal curvature. In other words, the conventional IOL power calculations that worked well to predict the required lens power in virgin eyes simply did not work in eyes that had previously undergone corneal refractive surgery. Over time, it was determined that, for IOL power prediction to be accurate for the postrefractive surgery eye, the calculation must incorporate certain adaptations.

With a multitude of new presbyopia-correcting treatments now available, we are once again in nearly uncharted IOL power calculation territory. Are the vergence formulas commonly used for IOL power calculation after myopic or hyperopic refractive surgery applicable for patients who have undergone presbyopia correction? We have recently conducted several studies to evaluate the accuracy of IOL power calculation after Intracor, an intrastromal femtosecond laser procedure to treat presbyopia. Below is a review of our results and some surgical pearls for cataract surgery after Intracor. We are less familiar with IOL power calculation after Supracor, but we also offer some preliminary pointers for IOL power calculation after this excimer laser presbyopia-correcting procedure.

OVERVIEW

Intracor is performed in the stroma as a flapless procedure. During treatment, the Victus Femtosecond Laser (Technolas Perfect Vision GmbH) creates five intrastromal concentric ring cuts, between 2 and 4 mm from the line of sight, to centrally steepen the cornea by approximately 1.00 D. This treatment changes corneal biomechanics, produces a myopic shift of approximately 0.50 D, and induces negative spherical aberration while sparing the epithelium, Bowman membrane, and Descemet membrane and maintaining corneal integrity. Correction of presbyopia and low hyperopic errors

A slightly myopic target refraction can potentially boost patient satisfaction.

BY TANJA M. RABSILBER, MD; MIKE P. HOLZER, MD, FEBO; AND GERD U. AUFFARTH, MD, FEBO

Figure 1. Three months after Intracor treatment, there is no sign of regression.
(0.50 to 1.25 D) is possible with Intracor. Astigmatism should not be greater than 1.00 D. In addition to combined correction of presbyopia and low hyperopia, Intracor’s advantages include:

- It is a flapless, minimally invasive procedure with a low risk of infection;
- There is no tissue ablation;
- The procedure lasts approximately 20 seconds;
- Postoperative recovery is fast and painless;
- More than 80% of patients are spectacle independent and gain an average of 4 to 5 lines of near vision postoperatively; and
- Refractive correction is stable through 36 months postoperative with no signs of regression (Figure 1).

As with any presbyopia-correcting procedure, certain compromises must be made. For Intracor, patient selection and informed consent are crucial, and patients must be counseled about a possible reduction in contrast sensitivity and distance BCVA after treatment. There is also risk for light phenomena postoperatively.

**IOL POWER CALCULATION FOR POST-INTRACOR EYES**

Although prospective, clinical data from a large patient cohort are needed, our recent studies suggest that IOL power prediction using modern vergence formulas (Holladay 1, Haigis, SRK/T, and Hoffer Q) and data from partial coherence interferometry (PCI) is accurate for post-Intracor eyes.3,4 We compared the accuracy of the clinical history method of IOL power calculation with that of routine PCI measurement after Intracor treatment.3 In 22 eyes, the median difference in keratometry (K) values between the clinical history method and PCI was only -0.21 D, resulting in median IOL power differences of between -0.23 D (SRK/T) and -0.29 D (Haigis). The differences in K and IOL power were not statistically significant (P>.17).

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**TAKE-HOME MESSAGE**

- Recent studies suggest that IOL power prediction using modern vergence formulas and data from partial coherence interferometry is accurate for post-Intracor eyes.
- Implantation of a monofocal IOL with a power that corresponds to a negative target refraction closest to plano is advised in post-Intracor eyes.
- After Supracor, the gold standard IOL power calculation is currently the clinical history method using K values and a stable manifest refraction before and shortly after Supracor.
We also published a clinical case report⁴ of a 58-year-old man who presented for cataract surgery in his right eye 8 months after Intracor. This patient had a near UCVA of 20/125 before Intracor that increased to 20/40 after laser surgery. Before cataract surgery, we used standard PCI data and the Holladay 1 formula without adjusting factors to determine IOL power. After uneventful phacoemulsification, a monofocal IOL was implanted in his right eye. After surgery, his spherical equivalent was 0.25 D, which was off of the target refraction by 0.26 D, but the effect of the cataract treatment remained stable, and near UCVA improved to 20/25 by 6 months after cataract surgery.

In conclusion, we perform our standard examinations preoperatively in post-Intracor eyes. At the moment, we would recommend implantation of a monofocal, acrylic, aspheric (aberration-neutral) IOL with a power that corresponds to a negative target refraction closest to 0.00 D to compensate for the slightly higher rate of IOL power underestimation.

CONSIDERATIONS FOR SUPRACOR

Our experience with IOL power calculation after Supracor is limited; however, this new corneal procedure, like Intracor, is intended for the correction of presbyopia. The main differences from Intracor are that Supracor is performed with an excimer laser (Technolas Excimer Workstation 217P) rather than a femtosecond laser, and it requires flap creation. The bilateral, aberration-optimized presbyopic algorithm can be used in eyes with hyperopia, emmetropia, and myopia. It can also be used in post-LASIK eyes. Thus, tissue ablation and corneal curvature changes must be considered.

A correction factor for IOL power calculation will probably be needed after Supracor; however, at this time there is no peer-reviewed literature available. We recommend a comparison of different methods for IOL power calculation after refractive surgery before deciding on the appropriate calculation. We can assume that methods that refer to current data, such as the Haigis L, may have to be adjusted due to the additional presbyopia-correcting algorithm used for Supracor treatment. At this time, we believe that the gold standard is the clinical history method using K values and requiring a stable manifest refraction before and shortly after Supracor treatment (ie, without cataract influence).

In order to ensure that this calculation is possible at the time of cataract surgery, we perform a final visit 3 months after Supracor to acquire the data. Patients are told to retain these calculations in a safe place until the time of cataract surgery. As with Intracor patients, the best IOL choice is a monofocal, acrylic, aspheric (aberration-neutral) IOL. We suggest targeting a slightly myopic refractive result, based on the refraction that the patient is satisfied with after the Supracor treatment.

CONCLUSION

Cataract surgery patients who have previously undergone presbyopia correction should always be counseled preoperatively about the potential risk for an inaccurate IOL power calculation and subsequent refractive surprise. In our experience, following a standard postoperative treatment after cataract surgery for patients who have previously undergone Intracor or Supracor is advisable, with emphasis on inflammatory prophylaxis and dry eye treatment. If correction of a minor residual refractive error is needed after Intracor, only surface ablation (PKR or LASIK) can be used. After Supracor, a flap lift seems to be the best retreatment option.

Gerd U. Auffarth, MD, FEBO, is Chairman of the Department of Ophthalmology, University of Heidelberg, Germany. Professor Auffarth states that he has received travel reimbursements and lecture fees from Technolas Perfect Vision GmbH. He may be reached at e-mail: ga@uni-hd.de.

Mike P. Holzer, MD, FEBO, is an Associate Professor, Vice Chairman, and Director of Refractive Surgery, Department of Ophthalmology, University of Heidelberg, Germany. Professor Holzer states that he has received travel reimbursements as well as lecture and consulting fees from Technolas Perfect Vision GmbH. He may be reached at e-mail: mike.holzer@med.uni-heidelberg.de.

Tanja M. Rabsilber, MD, practices at the International Vision Correction Research Centre, Department of Ophthalmology, University of Heidelberg, Germany. Dr. Rabsilber states that she has received lecture fees from Technolas Perfect Vision GmbH. She may be reached at e-mail: tanja.rabsilber@med.uni-heidelberg.de.

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