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IOL Power Calculation After Refractive Surgery

The Lenstar optical biometer provides the user with sophisticated state-of-the-art prediction algorithms for IOL calculation in postrefractive eyes.

Modern techniques and innovations used in refractive surgery lead to highly predictable and accurate vision outcomes. The success of laser vision correction surgery has in many ways raised the bar on patient expectations, and this especially is the case for the patient undergoing cataract surgery who has a previous history of refractive surgery. These individuals frequently have high expectations for their vision after cataract surgery. And even though the prediction accuracy of IOL power for virgin eyes is very good, it is significantly lower in eyes after laser refractive surgery.[1]

SOURCES OF ERROR IN IOL CALCULATION OF POST-LASER REFRACTIVE PATIENTS

There are two primary sources of error in calculating the IOL power in postrefractive eyes. First, there is a measurement error of the central corneal power that is due to a change in the corneal front surface, which alters the Gullstrand ratio. This change leads to a wrong corneal power measurement when standard conversion of corneal radii to corneal power is used. Second, many of the most commonly used IOL power formulas are prone to an internal calculation artifact except of the Haigis and the Shammas formula. The cause of this artifact is that most formulas use axial length and corneal power to estimate the effective lens position. This calculation artifact interferes with determining the effective lens position and result in an insufficient IOL power following myopic LASIK and overabundant IOL power following hyperopic LASIK. The magnitude of these errors increases relative to the amount of the prior laser vision correction.

Fortunately, surgeons have many tools available to help overcome these issues in calculating the IOL power for postrefractive eyes. The most popular aid for this purpose is an Internet-based postkeratorefractive surgery IOL power calculator offered by the American Society of Cataract and Refractive Surgery (http://iolcalc.org/).

Lenstar is a complete optical biometer for all clinical situations.

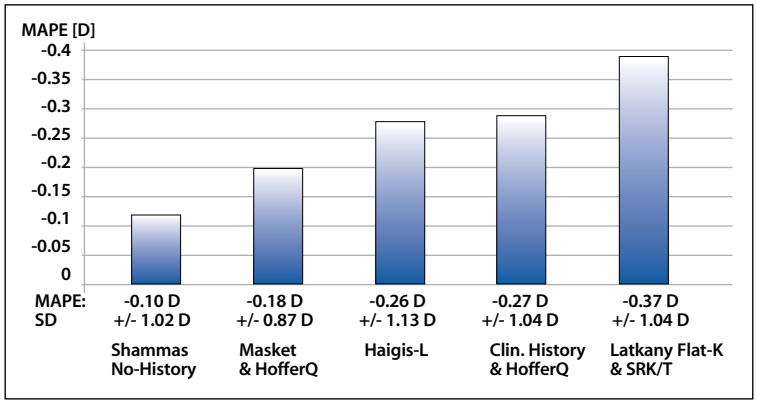
The Shammas No-History provides the user with reliable IOL prediction even if there is no clinical history available.

IOL POWER PREDICTION FOR POSTREFRACTIVE PATIENTS WITH THE LENSTAR OPTICAL BIOMETER

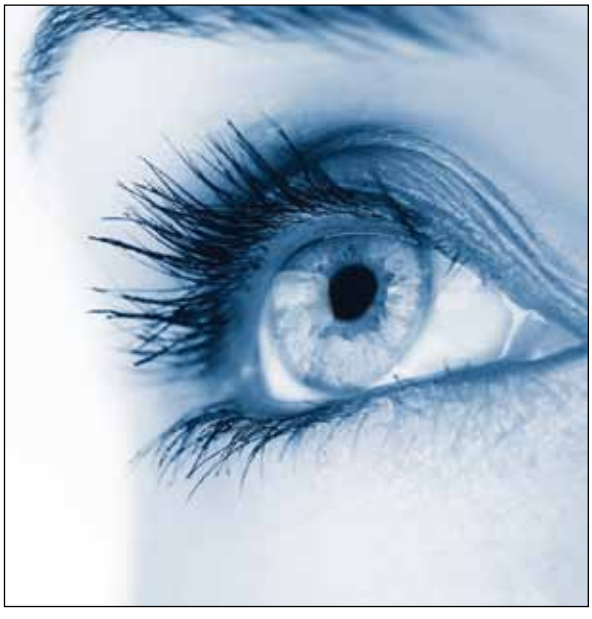
The Lenstar optical biometer offers the user three sophisticated IOL prediction methods for patients after refractive surgery. The methods offered may be divided into two groups. The first group requires only contemporary measurements taken by the Lenstar without any historical data. The second group requires knowing the stable change in the manifest refraction produced by the laser refractive surgery.

The Shammas No-History[2] method belongs to the first group. As the name indicates, this method can be used for patients where no clinical history is available. All that is needed is current Lenstar data. This method was developed by John H. Shammas, MD, in 2007 based on his IOL prediction formula for virgin eyes. The original Shammas formula does not produce a post-LASIK calculation artifact due to the fact that its estimation of the effective lens position does not use the central corneal power. For this reason, only the post-LASIK keratometric value has to be corrected.

The Masket[3] and Modified Masket[4] methods for IOL power calculation in patients with prior



The mean arithmetic prediction errors and standard deviations in the top five most popular IOL calculation methodologies.[5]



With the on-board IOL prediction methods Shammas No-History, Masket, and Modified Masket, the Lenstar optical biometer offers the surgeon several of the best IOL calculation formulas for post laser refractive patients.

myopic or hyperopic ablative refractive surgery represent the second group. These two methods require knowing the stable change in the manifest refraction following laser vision correction, typically 6 months to 1 year following refractive surgery. For both methods, the IOL power prediction is based on a regression-derived modification of the output of the Holladay 1 formula. The Modified Masket method was developed to extend the range of the original Masket method for those patients who may have undergone larger amounts of refractive surgery.

CLINICAL EVIDENCE

Wang et al assessed the efficacy of currently accepted IOL prediction methods available on the ASCRS online calculator in 70 eyes.[6] The average IOL prediction power of all these published methods is regarded the gold standard with a mean arithmetic IOL power prediction error of 0.11 D and a standard deviation of 0.76 D.

According to this study, the Shammas No-History method, relying on Lenstar data only, performed very similar to the gold standard, with a mean arithmetic error of -0.24 D and a standard deviation of 0.81 D. When it was compared to the Haigis-L method, the Shammas No-History method demonstrated equivalency. The Masket and the Modified Masket methods performed even better, with a mean arithmetic error of 0.49 D and -0.02 D, respectively, and a standard deviation of 0.79 D for both formulas.

These findings are well in agreement with a study by McCarthy et al that compared the Shammas No-History formula as well as Masket and Modified Masket methods to several other history and nonhistory-based post-refractive IOL prediction methodologies including the Haigis-L.[7]

CONCLUSION

Using the Shammas No-History, Masket, and Modified Masket IOL power prediction methods with the Lenstar optical biometer offers surgeons several of the best methods for accurately predicting the correct IOL power in eyes with a history of refractive surgery. ■

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