THE LENS CONSTANT

The second installment of this two-part series discusses how to improve the refractive outcomes of cataract surgery by optimizing this variable.

Read Part One Now

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This article discusses the practicalities of optimizing the lens constant to suit your personal preferences in biometry and cataract surgery in order to improve refractive outcomes. Scan the QR code to read part one of this series, which discussed the lens constant and how to manipulate it.

OPTIMIZING THE LENS CONSTANT

Clinically, the most powerful feature of a lens constant is its ability to adjust the recommended IOL power to achieve a particular refractive aim when the type or position of the IOL inside the eye changes. The 1:1 nature of the lens constant to IOL power ratio means that the lens constant can be used to determine necessary changes in IOL power in these situations (see *Determining IOL Power Changes With the Lens Constant* for an example).

FUNDAMENTAL 1 **Choose by biometer.** You can have lens constants for left and right eyes if your results vary enough to warrant this. The simplest refinement, however, is to have lens constants for certain IOLs depending on whether biometry is performed with an A-scan ultrasound or with partial coherence interferometry of an optical biometer. A different lens constant is required for the same IOL because there are subtle differences in measurements of axial length. The difference in lens constant allows this.

FUNDAMENTAL 2 **Account for surgeon factors.** Further refinements can be made to account for surgeon factors. You can review your refractive prediction error in a selection of previous cases to take into account subtle differences ranging from surgically induced astigmatism to capsulorhexis size. Perhaps a review of your 100 most recent cases reveals consistently achieving outcomes that are 0.25 D more myopic than your target. Instead of consciously aiming for a slightly more hyperopic target, you can refine and personalize your lens constant for a particular IOL and set this as the default setting on your biometer for ease of calculation.

FUNDAMENTAL 3 **Look for a systematic error.** Optimizing your lens constants should not be a miserable experience, but it requires a little thought—especially if you have worked at multiple clinics. The key thing to remember is that you are aiming to optimize outcomes for a stable, consistent set of conditions. Ideally, the patients you use to optimize your constants had their measurements taken with the same device, their surgeries involved the same techniques, and the same style of IOL was implanted. At the least, I recommend using data from a single surgeon and only one model of IOL. This may seem obvious, but you do not want to optimize your lens constants based on grouped results of all nontoric monofocal aspheric IOLs, for instance. Quite a few cases are required before optimization can or should be performed.

You are looking for a systematic error that can be identified and adjusted accordingly. A case that was extremely difficult with a wound burn or a torn capsule can certainly alter your overall results but should not be included in the analysis. There will always be variation in refractive outcomes because you are operating on human beings with complex visual systems. If refractive errors in an analysis show some mildly myopic and hyperopic results but the overall average is excellent, you cannot make a systematic adjustment to improve the results on either side of zero. This illustrates why it is important to analyze your results and consider whether they can be broken down into subgroups where an adjustment to the lens constant can be helpful.

For instance, you may have an overall average error of zero. On closer inspection, all of the long eyes had myopic errors, and the short eyes had hyperopic errors. This could allow you to consider optimizing your lens constant for these two groups separately. Your average refractive error should remain zero, but you may be able to improve outcomes for these groups and for individual patients.

FUNDAMENTAL 4 **Know your results.** In order to improve your results, you need to know your results. This means performing a subjective refraction when the eye is stable. Usually this is around 4 to 6 weeks postoperatively. Some surgeons prefer not to refract happy patients in case doing so shows them that they could see better. However, without this refraction, you cannot analyze and improve your outcomes. Armed with your preoperative biometry, a stable subjective refraction, and preferably (though it is not essential) postoperative biometry, you are ready to start optimizing your lens constant.

Ongoing optimization of lens constants makes sense considering that the original values may become outdated—potentially having been measured several years earlier—and considering that techniques might have changed. As with any audit cycle, it is important to

DETERMINING IOL POWER CHANGES WITH THE LENS CONSTANT

Changing from a standard one-piece IOL in the bag with a lens constant of 118.80 to an anterior chamber IOL with a lens constant of 115.50 requires a change in the IOL power due to the difference in lens constants of 3.30. If you were originally planning to implant an IOL with a power of 23.50 D and the goal is emmetropia, you would choose an anterior chamber IOL with a power of 20.20 D in order to achieve the same outcome. An IOL with a power of 20.00 D would be the closest available option, but it would likely produce a +0.20 D hyperopic outcome. Another option would be to implant a 20.50 D IOL and aim for a -0.30 D outcome. All of this can be worked out using just the lens constants of the two IOLs.

follow the steps of optimization, analyze outcomes, and further refine the lens constant. This cycle can be updated after perhaps every 100 eyes.

FUNDAMENTAL 5 **Leverage available resources.** If you are getting started with lens constant optimization, I recommend talking to the local representative for the manufacturer of the IOL with which you are going to start. This person has a vested interest in improving your refractive outcomes and will usually be able either to guide you through the process or to perform the optimization for you. It can be reassuring to have an expert check the outcome of your first optimization.

The IOL database, Iolcon.org, not only provides manufacturer-derived lens constants but also an optimization service. You can send outcomes to this website to further optimize these base constants. I feel there are too many unknown factors at play to use another surgeon's optimized constants because, even within the same practice, two surgeons may have different optimized constants. Nevertheless, the published optimized constants based on huge numbers of IOLs implanted provide a starting point for individual optimization.

Certain popular biometry systems have built-in lens constant optimization options. Refractive data can be fed into the device. After a specified number of cases, lens constants can be optimized and directly used for IOL calculations. A benefit of using an all-in-one biometry-to-surgery-to-audit system is that it allows you to pick and choose which cases to include in the audit and optimization process. As discussed, any unusual or complicated eyes can skew the outcome markedly, so, even though it can be tempting to keep and use as much collected data as possible, discard these eyes from the analysis.

Warren E. Hill, MD, and Jack T. Holladay, MD, MSEE, FACS, also offer lens constant optimization via their respective websites, www.doctor-hill.com and www.hicsoap.com.

CONCLUSION

If you have a basic analysis of your average residual refractive error in a stable series of postoperative patients, you can easily make inferences about how you may wish to adjust your lens constant. However, given the increasing prevalence of toric IOLs and taking into account astigmatic refractive outcomes, I recommend getting assistance with the optimization process.

I hope this series has answered some questions you had and shown how you can leverage lens constants in IOL power calculations to optimize your refractive outcomes. ■

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