

# CHANGING THE GAME



The Hill-RBF Calculator harnesses artificial intelligence to select IOL power.

BY STEPHEN V. SCOPER, MD

Of the tools and technologies that I have incorporated into my practice over the past few years, a handful have been complete game-changers. The Hill-Radial Basis Function (Hill-RBF) Calculator—a method that selects IOL power using artificial intelligence-driven pattern recognition rather than effective lens position—is one of those game-changers. The Hill-RBF Method, which is available exclusively on the Lenstar (Haag-Streit), has increased my level of confidence in selecting the appropriate IOL power and, therefore, has resulted in better post-operative outcomes for my patients. For those who do not have a Lenstar, the Hill-RBF Method is available online at <https://rbfcalculator.com>. For the first time, I am able to consult one IOL calculation method for any type of eye. I no longer have to think, “Is this a short eye or a long eye? Is this a regular eye or an irregular eye?”

## BACKGROUND

Any calculation that uses a radial basis function is a form of sophisticated mathematical modeling using artificial intelligence-driven pattern recognition. Because the Hill-RBF Calculator is entirely data driven and does not depend on the effective lens position, it is free of calculation bias. The key advantage to this calculator over theoretical IOL power formulas is that it uses the process of adaptive learning—the ability to learn tasks based only on data and independently of what is previously known.

Created by Warren E. Hill, MD, and the engineers and mathematicians at MathWorks, the Hill-RBF Method represents an exercise in big data. The method’s current foundation is data from more than 12,400 eyes, and more data is being collected by surgeons from around the world every day.

## BUILD YOUR CONFIDENCE

Currently, the Hill-RBF Calculator is a helpful way to get great results right now, but in the next few years, it’s going to get even better. This is because the more eyes

that are added to the database, the higher the likelihood that similar eyes are available and the better the calculator’s accuracy.

The Hill-RBF Calculator also establishes when it does not have enough data to make a good estimation of IOL power. This is helpful to me as a surgeon because it alerts me to the possibility of an IOL power calculation not being as accurate as it could be. Hill-RBF is the only IOL calculation method that incorporates such a reliability check, leading to improved confidence in the prediction results.

There are certain patients in whom it is really hard to reach the target refraction, regardless of what kind of IOL is chosen—from standard, to toric, to multifocal, to extended depth of focus. There are so many lenses out there, and, quite frankly, it makes some doctors a little apprehensive about recommending a particular IOL when they do not have the confidence of being able to deliver what they are recommending.

To get good results with whatever IOL you are using, you have to hit your spherical equivalent. The goal is to come within  $\pm 0.50$  D of that intended spherical equivalent. If you can get it in that range, patients should achieve good vision without glasses, and that’s what they want.

Of course, the ultimate goal is to hit that spherical equivalent 100% of the time, but that is nearly impossible. Most surgeons who use previous-generation formulas hit that goal, if they’re doing really well, 75% of the time. If you’re putting in a multifocal or a toric IOL and 25% of patients aren’t within  $\pm 0.50$  D of the intended spherical equivalent, you are going to have a lot of unhappy patients. That turns into a negative experience for the surgeon, who may be likely to give up and stop using such premium IOL technologies.

A lot of surgeons work very hard to get 80% of patients hitting that spherical equivalent, but with the Hill-RBF Method, I believe they can get even better. I believe that this Hill-RBF Method really is the missing link in giving doctors the confidence that they have been lacking.

## PERSONAL EXPERIENCE

I started using the Hill-RBF Calculator very early on as a beta tester and have been using it for well over 7 years. Now, it is my go-to method to calculate IOL power. I have a spreadsheet with several formulas including the Hill-RBF, Barrett, and Holladay 1 and 2, and I rely on the results of the Hill-RBF Calculator and compare that with the results from the other formulas to further assert my confidence. So I really look to the other formulas for confirmation only.

I recently reviewed my results with the Hill-RBF Calculator to determine how often I hit the spherical equivalent within  $\pm 0.50$  D in eyes that received a standard monofocal IOL. Of 288 eyes, 141 had a normal axial length (22.5–25 mm). In this population, I hit  $\pm 0.50$  D spherical equivalent in 97.2%. In 60 long eyes ( $> 25$  mm), I hit that target in 98.3%; in 87 short eyes ( $< 22.5$  mm), I hit the target in 88.5%. That may not sound like a very high number, but that's an excellent number in short eyes because with other formulas it is closer to 60%.

Now when I have patients come in who are a 3.00 or 4.00 D hyperope, I have the confidence of not only hitting my spherical equivalent with a standard monofocal lens, but I also have the confidence to hit my target with a multifocal or a toric lens. Before the Hill-RBF Method, I was very wary about putting a multifocal IOL in a highly hyperopic eye.

The other end of the spectrum is high myopia. So likewise, when I have patients who are a -10.00 D myope, I can look in their eyes with confidence and tell them they are going to have a great result. And again, with confidence, I can recommend a multifocal or toric lens, knowing that there is a 98% chance that I will hit my spherical equivalent.

## CONCLUSION

One thing that continues to hold many surgeons back from using more premium IOL technologies is the lack of confidence in getting great results for their patients. There are so many new technologies and so many different IOL power calculations out there that some surgeons don't know which one to use. I think patients can tell when a surgeon is not quite confident about hitting the visual goal.

In my experience with the Hill-RBF Method, it has brought me up to the next level of confidence. I have confidence in my IOL selection, my staff has confidence that we're going to give the patient the best possible

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care, and the patient has confidence that I will deliver the result I promised. I believe that my patients can see that confidence in the doctor and in the staff. In return, they have the confidence that they're going to get what they want.

I would encourage all surgeons to acquire the confidence in the Hill-RBF Method. Yes, you can get these same great results. It's not just for a few high-volume surgeons—it's for all of us. Every ophthalmologist has the same goal: to provide the best possible care and results for all of our patients. With the Hill-RBF Calculator, we all have that ability to get great results for our patients, and the development of this tool is an important step in that direction. ■

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## TAKE A LOOK

Instructions for use of the Hill-RBF Calculator can be found at:  
<http://rbfcalculator.com/docs/Hill-RBF-Calculator-Instructions.pdf>