ORIGINS NEXT-GENERATION ONLINE IOL RESOURCES



How the ESCRS IOL calculator and eyeSpace came to be.

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ESCRS IOL CALCULATOR

Dante Buonsanti, MD

The idea to develop a multiformula online IOL calculator was bouncing around my mind for a couple of years before it really took shape. Then, I was in the audience as Kenneth J. Hoffer, MD, presented the Hoffer Q/Savini/Taroni (Hoffer QST) formula at the 2020 ASCRS Annual Meeting. I had recently purchased an IOLMaster 700 (Carl Zeiss Meditec) and wondered why the machine did not include this brand new formula. I was frustrated that practitioners' access to new IOL formulas depended on industry's providing an update.

I realized that the speed of industry software updates would never match that of the internet, where lens constant values can be optimized and new formulas can be leveraged immediately. I wanted to create an online IOL calculator that would function like a flight or hotel booking website; the user enters the relevant data, and the site returns the available options from across the internet. An online IOL calculator that leveraged multiple modern formulas simultaneously by web scraping or application programming interface integration would increase efficiency and minimize transcription errors by eliminating the need to enter the same data into various formulas. It could also optimize outcomes by employing more formulas.

TORICALIGNER.COM

I developed ToricAligner.com (scan the QR code on the following page; Figure) with Giacomo Savini, MD, from Italy. The site enables IOL power calculations for realigning any rotated or misplaced toric IOL, including pseudophakic toric IOLs, phakic toric IOLs, and piggyback IOLs. The site considers the surgically induced corneal astigmatism (SICA), and the ratio of toricity, which is a critical factor (the same IOL will not correct the same amount of astigmatism in a 22- or 27-mm eye).

Additionally, the site enables the easy calculation of SICA by inputting pre- and postoperative total corneal astigmatism. If you log in, you will be able to save your records and results and calculate your average, maximum, and minimum SICA. More features will be available soon.

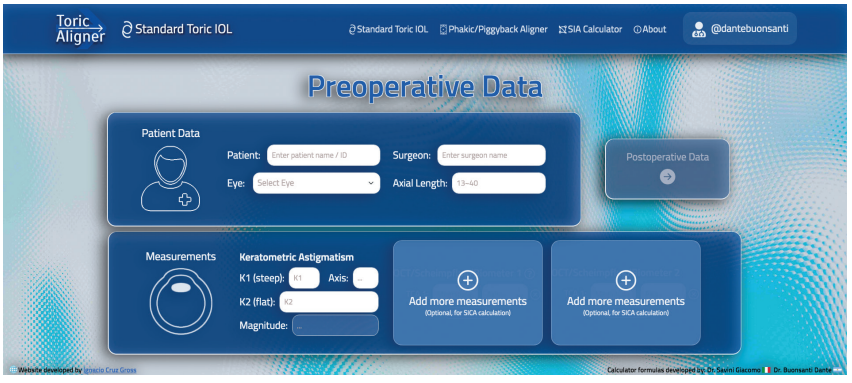

Figure. The homescreen of ToricAligner.com.

DEVELOPING THE CALCULATOR

When I started developing the calculator, I contacted the authors of all the formulas it would be leveraging, including Dr. Hoffer. He liked the idea so much that he put me in contact with the board of the ESCRS, and they decided to make it the official ESCRS calculator. From there, I began meeting periodically with the IOL calculator team at ESCRS, composed of Adi Abulafia, MD; Oliver Findl, MD, MBA; Nino Hirnschall, MD, PhD; Miguel Raimundo, MD, MSc; and Filomena Ribeiro, MD, PhD, FEBO.

We contacted each formula's author to obtain their approval and were glad that everyone was willing to participate (see *IOL Power Formulas Included in the ESCRS IOL Calculator*). Suggested A-constant values are updated automatically, and the calculator always suggests the A-constant from the formula author's site first. If there is no

IOL POWER FORMULAS INCLUDED IN THE ESCRS IOL CALCULATOR

The formulas leveraged by the ESCRS IOL Calculator as of this writing include the following:

- Barrett Universal II formula
- Cooke K6 formula
- EVO formula
- Hill-RBF formula
- Kane formula
- Hoffer QST formula
- PEARL-DGS formula
- Castrop formula (coming soon)
- Holladay 2 (coming soon)

A-constant available there for the desired IOL, the optimized value from IOLcon.com is used. If neither is available, the User Group for Laser Interference Biometry or manufacturer value is used.

In addition to the ESCRS IOL calculator, I have developed another free online tool for IOL power calculation with Giacomo Savini, MD, that provides a range of features to help calculate IOL power for realigning any rotated or misplaced toric IOL (see *ToricAligner.com* on the previous page and scan the QR code for more information).

CONCLUSION

The ESCRS calculator is available at iolcalculator.escrs.org (scan the QR code). We are currently working on toric and postrefractive surgery modifications and hope to complete them before the 2023 ESCRS Annual Meeting in Vienna.

LEARN MORE

EYESPACE

Alexander Miller, MD, and Ariess Gharabagi, BS

The greatest source of support during the transition from medical school to residency is often senior residents, co-residents, and faculty. I (A.M.) am lucky to be part of a program that is full of helpful mentors who are always willing to teach. My senior resident, Matt Hirabayashi, MD, developed a website (EyeFlyMD.com) with multiple resources, including *The Eye Guide* series, which is available on Amazon as a paperback book or on his website as a free PDF. Another resource developed by Dr. Hirabayashi and my junior resident, Gurpal Virdi, MD, is an iOS application known as eyeSpace.

EYESPACE

To our knowledge, there is no comprehensive source of FDA-approved IOLs to learn from. eyeSpace contains the IOL Reference utility (also available on IOLReference.com for Android users), which has a comprehensive catalog of almost 10,000 individually FDA-approved IOLs. Users can search and browse the lenses available in the United States and view all relevant information in a standardized way.

The sleek interface has an advanced search function that allows surgeons to input their desired lens parameters, including power, one-piece or three-piece design, material, toricity, color, compatible cartridges, and others. It is often difficult to track down current IOL information (eg, A-constants or asphericity), but IOL Reference makes this an easy task. Using the search function, ophthalmologists can find lenses to fit their unique cases, such as extreme powers or rare lens configurations (eg, a preloaded three-piece IOL). This application streamlines surgical decision-making and planning and has the potential to individualize cataract surgery while allowing clinicians to stay current on the full spectrum of US lens technologies.

eyeSpace also recently introduced a feature for tracking cataract surgery refractive outcomes. Users input preoperative biometry, other case details at their preference (eg, case time, cumulative dissipated energy), and postoperative refraction and keratometry to access their personalized refractive outcome analysis, including refractive miss rate and surgically induced astigmatism (SIA). Many calculators and biometers require SIA, and the eyeSpace app allows surgeons to input their personalized data.

The eyeSpace team has immediate plans to further expand functionality. Dr. Hirabayashi is most excited about the implementation of double-angle plots for SIA, personalized A-constants, refractive outcome graphs, a patient-facing outcome tracker where patients can contribute to data collection, and a forum that connects mentors and mentees. According to Dr. Virdi, machine learning will be able to interpolate the data and construct real-world performance and defocus curves of each IOL based on the aggregation of data; the possibilities to improve both individual and industry-wide outcomes are endless. The eyeSpace team is exploring other subspecialty spaces, including retina and glaucoma. ■

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