User Manual

Panacea IOL & Toric Calculator

Version 8(6.0)

Content

Introduction

The application Panacea IOL & Toric calculator was developed to help and assist the ophthalmologist in his daily practice of calculating the power of the intraocular lens in the most precise way through a series of programs and sub-applications. This is valid for monofocals, multifocals, and toric lenses. The application also includes a toricity calculator, as well as calculations for phakic and aphakic intraocular lenses.

Additionally there are options for optometric formulas including:

- Toric contact lense calculator
- Prisma calculator
- Vertex distance calculator
- Cromatic lateral aberration Abbe.

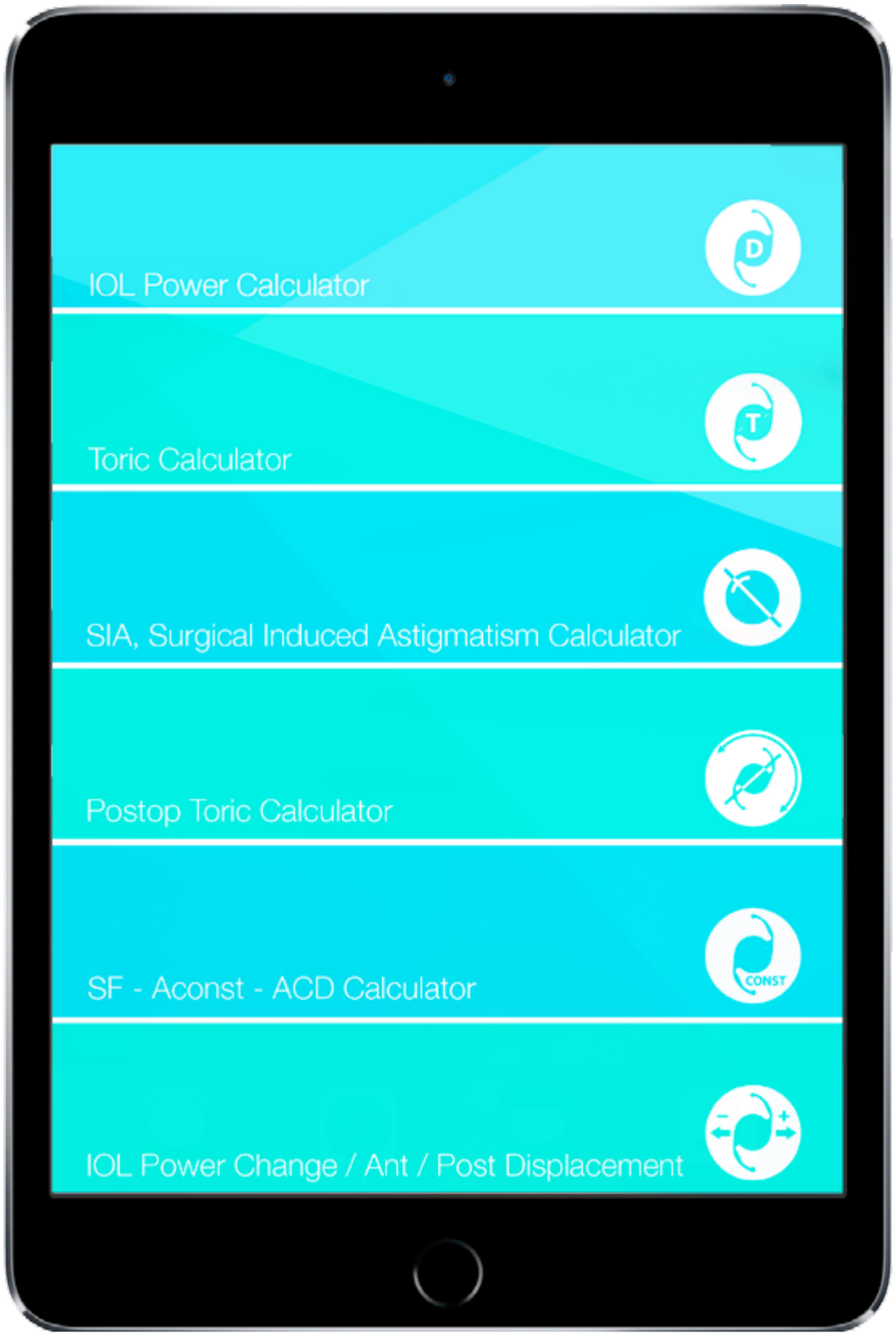
Furthermore, it offers an application for intraocular pressure compensation taken with Goldman tonometer according to the radius of the corneal curvature, age and corneal thickness.

These programs are sub-arranged in menus and these in sub-menus, described in figure 1.

Main menu

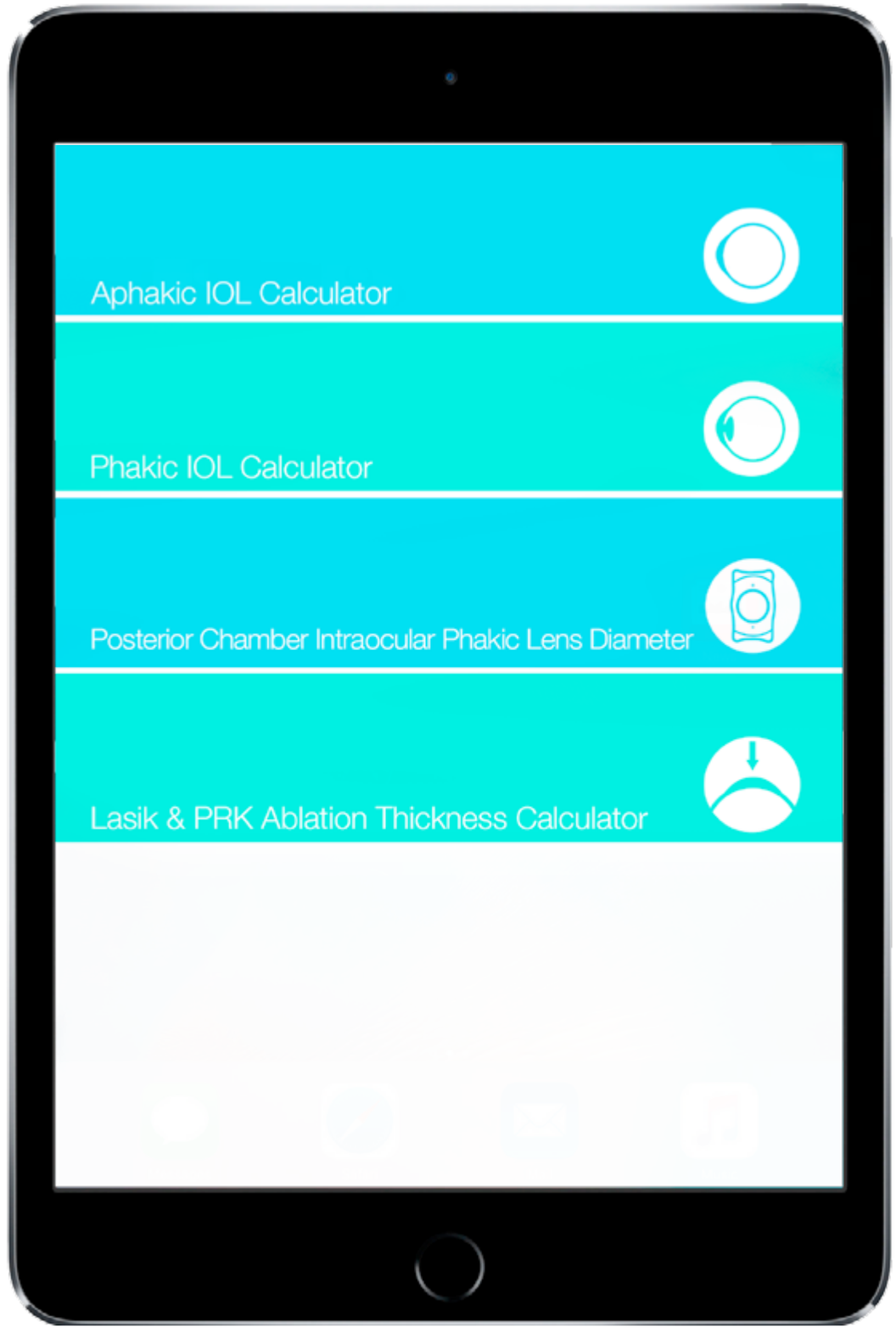
SUBMENU 1

IOL Power & Toric Calculator



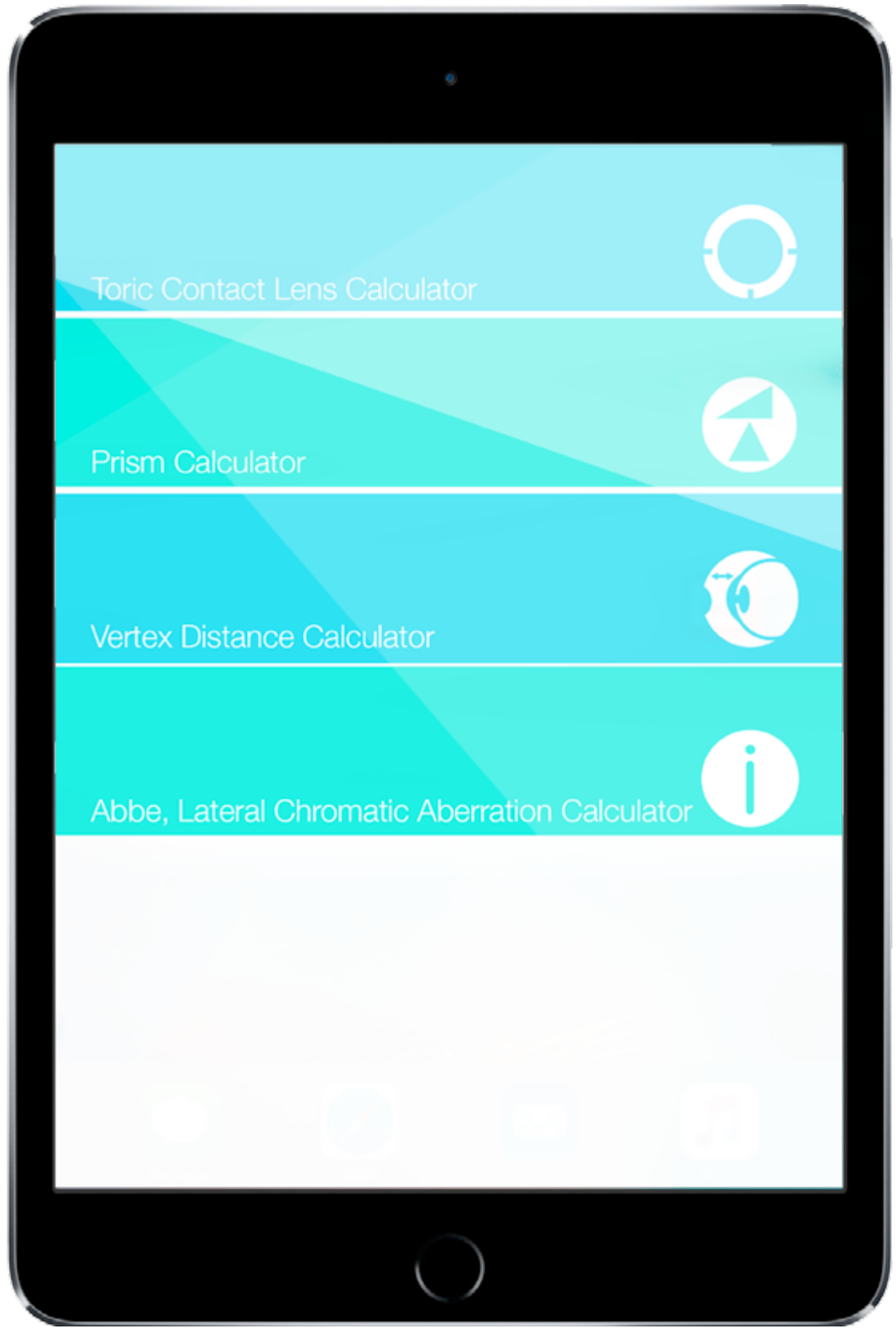
SUBMENU 2

Aphakic / Phakic Calculator



SUBMENU 3

Optometric Formulas Calculator



Use instructions and generalities

IOL Power & Toric Calculator

Use instructions and generalities

Important note:

1. To obtain an optimum result, it is indispensable to introduce into the program all the data and variables of each individual eye. If there is a lack of any of these, one can enter de median for the variable, assuming that the eye in question is of normal characteristics, but the individualization of the calculation will be lost.

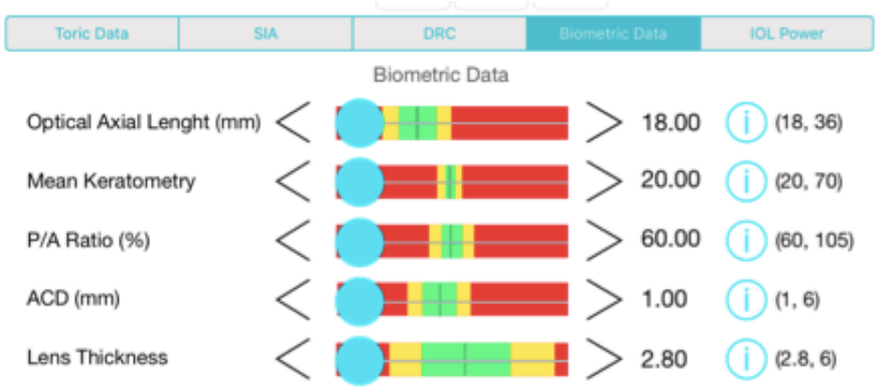
2. There are some variables which show a colored bar, this is accommodated according to the standard deviation in the following way:

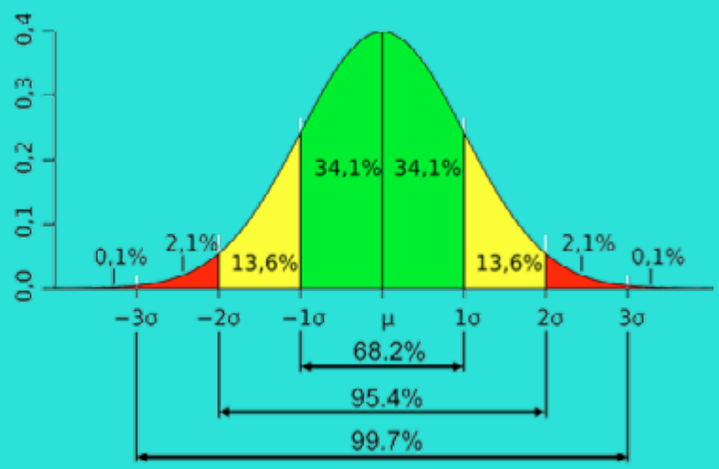
Central line: This is the median of the population.

Green: Distribution area for 1 standard deviation (68.2% of the population).

Yellow: Distribution area for 2 standard deviations (95.4% of the population).

Red: Distribution area for 3 standard deviations (<4.5% of the population).





These standard deviations help us in two different ways:

1. If we introduce a value in the red area, we have to re-check the value, because the possibility of a patient being in this range is low.

2. The result of the calculation with variables in red areas will be different than in other programs that don't take into account this data.

The program screen is divided in two segments:

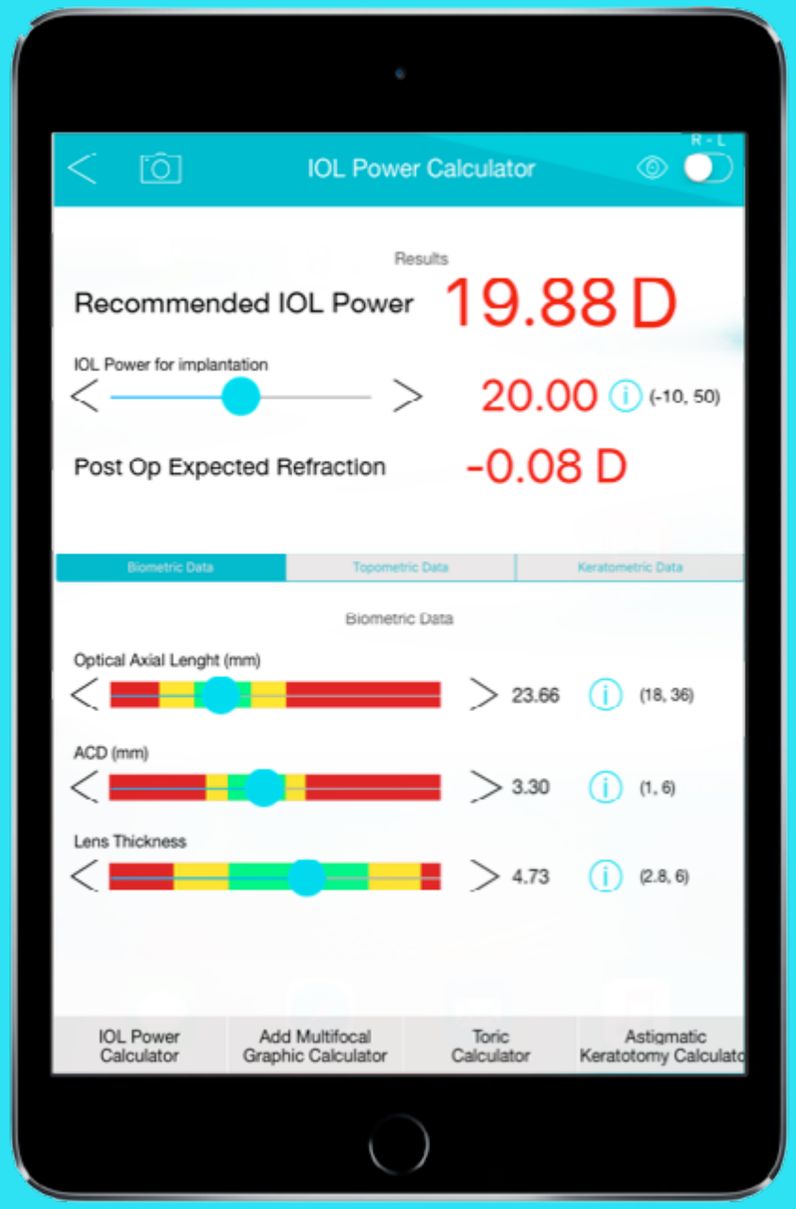
1. Superior: Shows the results of the calculations..

2. Inferior: Shows the variables that need to be introduced.

To facilitate the use of the Panacea Calculator, the variables that are found in the sub-menus, which can be accessed by clicking over the title. Different options can be found in the base program, which can be accessed by clicking in the inferior portion of the title, maintaining the data already inserted.

IOL Power Calculator

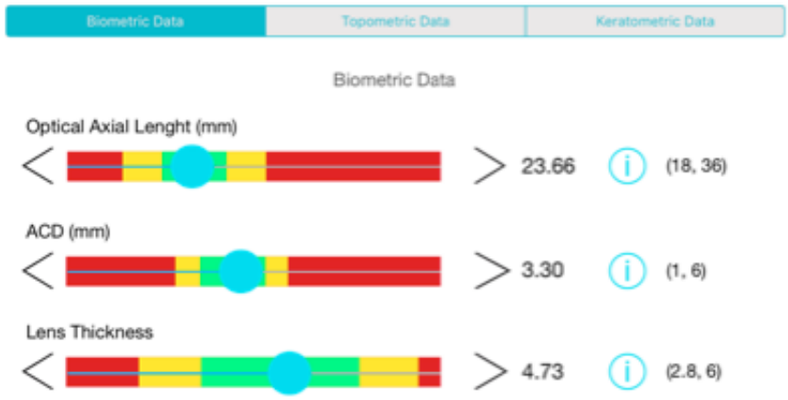
Intraocular lens power calculator program.



Variables used:

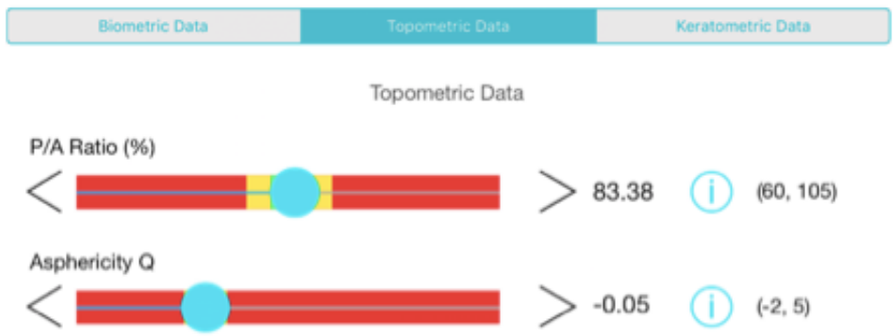
1. Biometric data:

- **Optical Axial Length** (in mm).
- **ACD** (Anterior chamber depth in mm).
- **Lens Thickness** (in mm).



2. Topometric data:

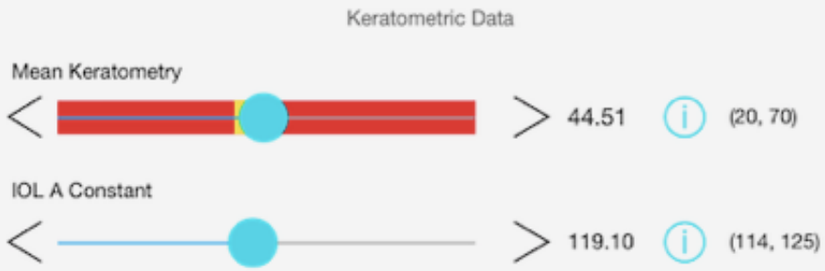
- **P/A Ratio** (Relationship between the radius of the anterior corneal curvature and the posterior corneal curvature in mm vs. the radius of the anterior corneal curvature in mm, multiplied by 100; it is a percentage).
- **Asphericity Q** (Corneal asphericity in Q of the anterior face at 6 mm).



3. Keratometric data:

• **Mean Keratometry** (Mean keratometry of the anterior face, ideal for rings of 1.8-2.2 mm, measured with Lenstar).

• **IOL A Constant** (Given by the production house. Ideally should be readjusted to each surgeon according to the type of IOL. The values reported by the ULIB group for SRK/T can be used as well.



Results:

• **Upper portion:** shows the results of the calculation.

• **Recommended IOL Power:** Power of the intraocular lens recommended by the Panacea Calculator to obtain a steady refractive result.

• **IOL Power for implantation:** Power of the intraocular lens planned for the surgery.

• **Post OP Expected Refraction:** Refractive result expected at corneal level.

Add Multifocal Graphic Calculator

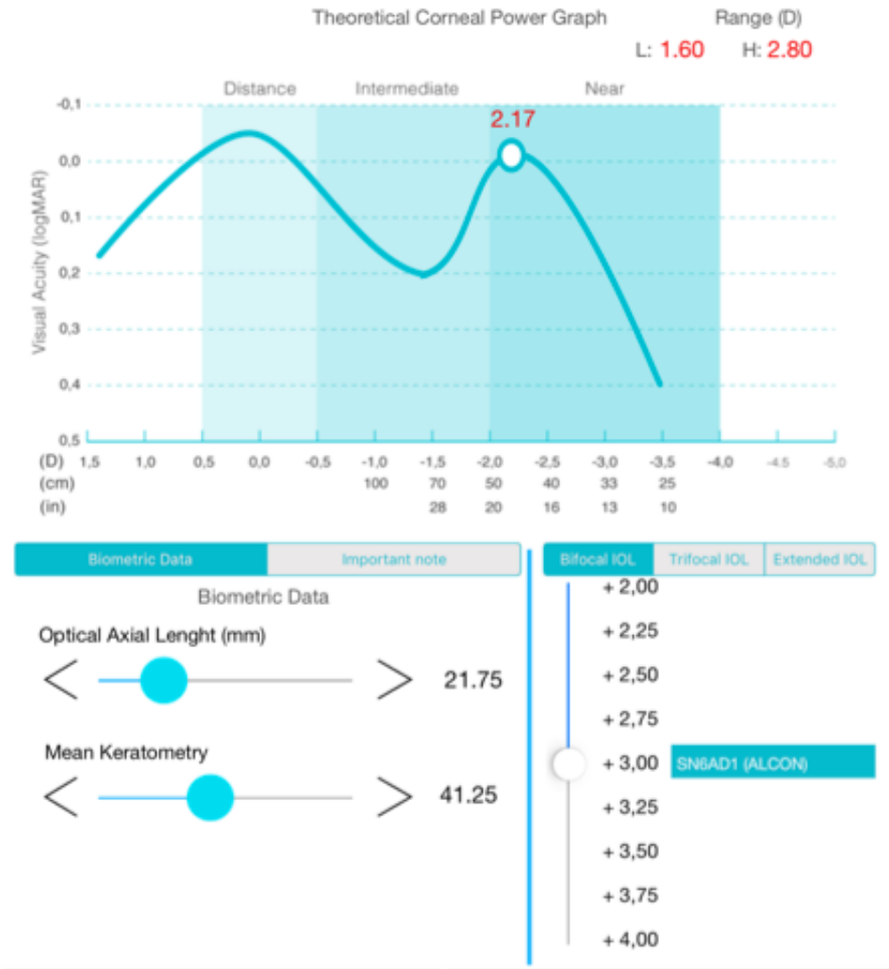
This allows us to graphic the defocus curve at corneal level of the eye in question (with the introduced variables). In the same way, in theory, the curves of near vision and intermediate vision for the different multifocal lenses and add power at intraocular lens level.

Variables used:

1. Biometric data:

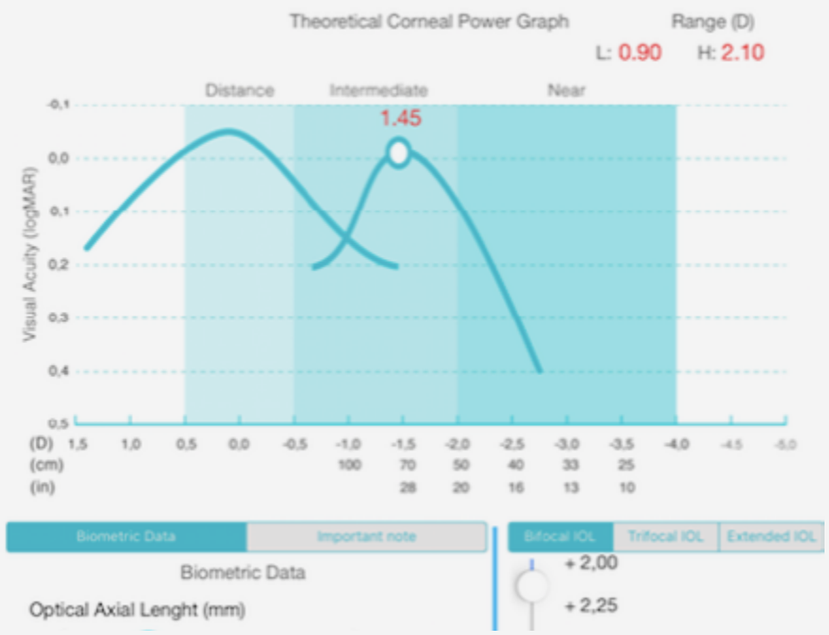
- **Optical Axial Length** (in mm).

- **Mean Keratometry** (Mean keratometry of the anterior surface, ideal in 1.8-2.2 mm rings, as measured with Lenstar or equivalent).

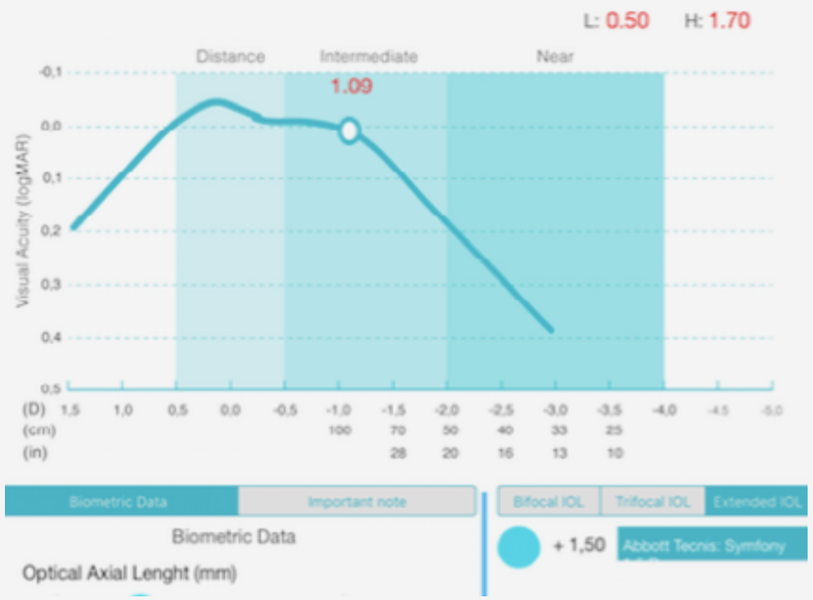


Within the variables of optional lenses, there are submenus for:

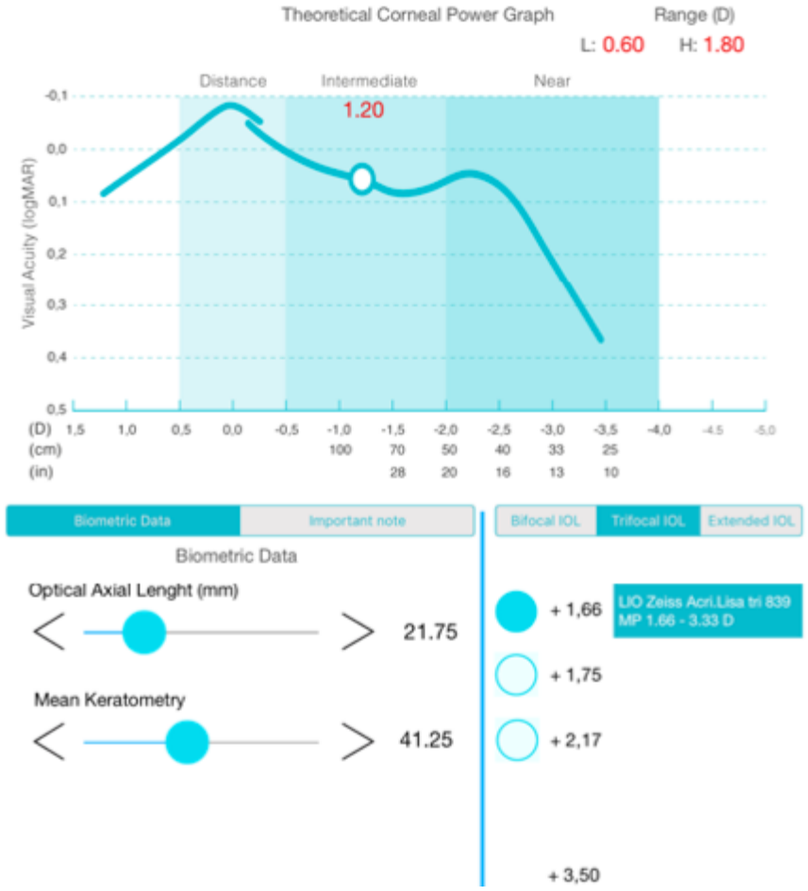
• **Bifocal IOL:** Bifocal intraocular lenses (with add powers that go from +2.00 D to +4.00 D at lens level, and graphs for the defocus curve for IOL Alcon Restor +2.5 D and +4.00 D and for Abbott Tecnis +2.75 D and +4.00 D).



• **Extended IOL:** (Abbott Tecnis Symphony lenses with focus extension technology).



• **Trifocal IOL:** Trifocal intraocular lenses (with defocus curves for Zeiss Acri. Lisa, PhysIOL micro F and Alcon Panoptix trifocal IOL).



Toric Calculator

This program allows:

1. The calculation of the toric power of the cornea in the anterior face plus the posterior face.

2. The calculation of the total corneal astigmatism, including the induced by the corneal incision.

3. The transformation of this astigmatism to the intraocular lens plane, and estimate the power necessary to leave the desired residual astigmatism according to the patient's age. (Keeping in mind that there is a vertical curving of the cornea every ten years of 0.25 D to 0.50 D, even in eyes with previous surgery).

4. Graphing the ideal axis of placement for the toric intraocular lens chosen.

5. Quantify the expected residual astigmatism at corneal level, according to the toric lens chosen, obtaining optimal end refractive result, whether using positive bitoric cylinder (most IOL, including Alcon, Tecnis, PhysIOL) or Positive cylinder lens such as Zeiss (correcting the toric IOL spherical power).

The variables used by the program are:

1. Toric data: (Corneal astigmatism). (Figure 1)

a. Corneal Anterior Surface:

- **Cylinder:** In diopters.
- **Flat Meridian:** In degrees.

b. Corneal Posterior Surface:

- **Cylinder:** In diopters.
- **Flat Meridian:** In degrees.

2. SIA: Surgical Induced Astigmatism: (Figure 2)

a. Cylinder: In diopters.

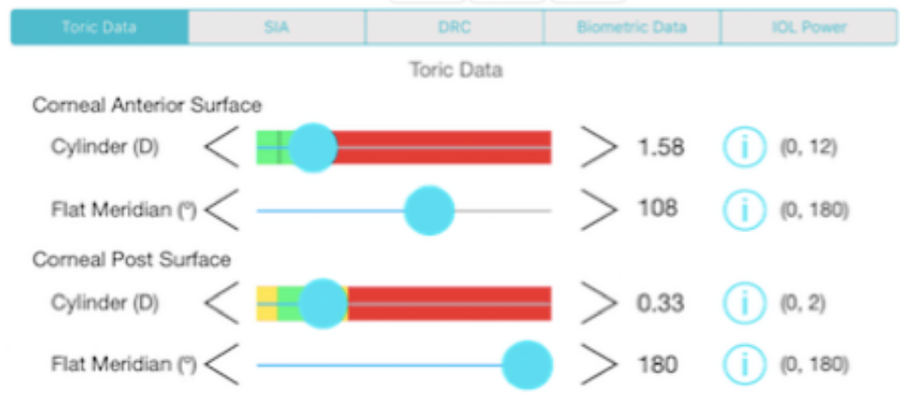
b. Axis: Axis at which incision is made.

3. DRC: Desired Residual Cylinder: (Figure 3)

a. Cylinder

b. Axis

1.

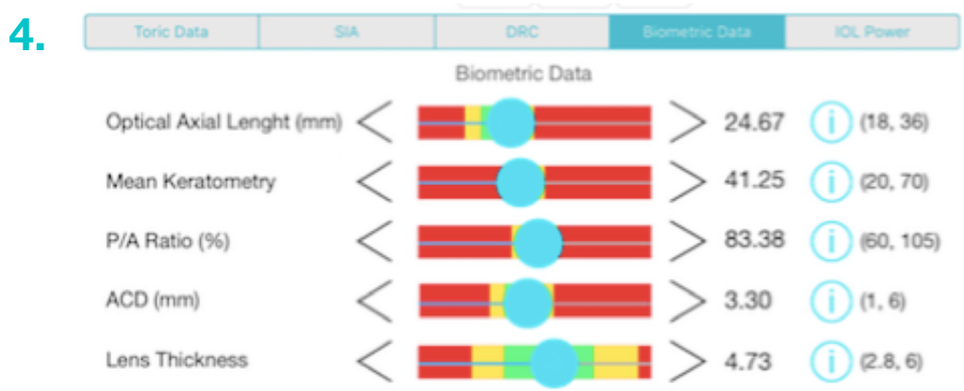


2.

3.

4. Biometric Data: (figure 4)

The data utilized for the calculation of the IOL power are reflected here, the program allows the modification of these, which include: Optical axial Length, Mean keratometry, P/A ratio, ACD and Lens Thickness.



5. IOL Power: (figure 5)

Here are the results obtained of the intraocular lens power calculations, including:

- **Recommended IOL Power:** IOL power recommended by Panacea Calculator to obtain the desired refractive result.

- **IOL Power for implantation:** IOL power planed to be used. With this power the spheric equivalent will be calculated as well as final refraction, according to the chosen toricity.

- **Post OP Expected Refraction:** Refractive result expected at the corneal plane level, when the planed IOL is placed.

- **Asfericidad en Q.**

- **IOL A Constant:** It can be changed in case the IOL being used has a different toricity or is from another brand.

Results:

In the superior half of the screen, the results of the calculations are found, with detailed information, including:

In the middle right portion of the screen:

1. TCA: Total corneal astigmatism: Results from the sum of the anterior face astigmatism and the posterior face astigmatism. This astigmatism is at corneal plane level. **(figure 1)**

2. TCA + SIA: Ocular astigmatism to be corrected, which includes the sum of total corneal astigmatism and the surgery-induced astigmatism. This is also at corneal plane level. **(figure 2)**

3. Residual Astigmatism: The residual astigmatism at corneal plane level, Calculated according to the toric IOL selected at the Toric IOL plane (light blue button). **(figure 3)**

Superior portion of the screen: (figure 4)

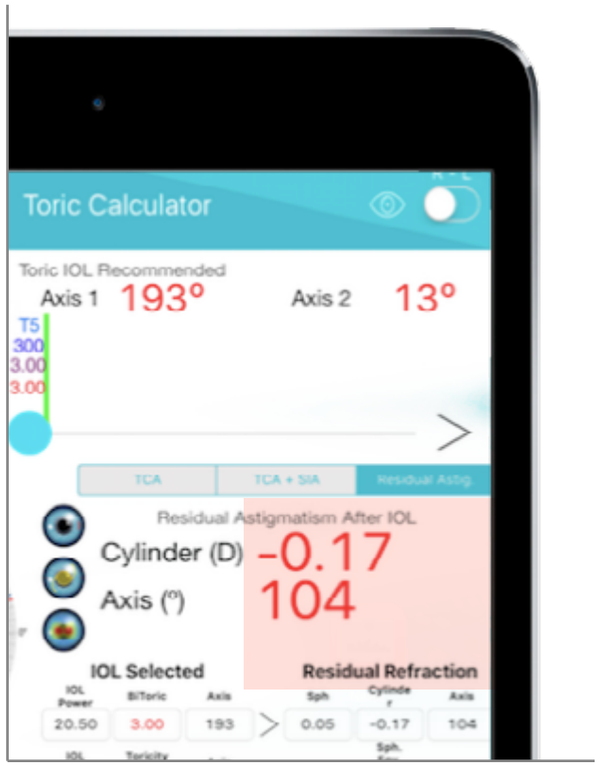
It presents the sum of astigmatism that is to be corrected (TCA + SIA), Calculated to have the desired post OP astigmatism at IOL plane level (Cylinder to be corrected at iris plane level, on this specific eye according to ELPo).

1. Lens plane astigmatism: Astigmatism to be corrected at IOL plane level to leave the desired residual defect.

2. Axis 1 y 2: Axis of astigmatism to be corrected to leave the desired residual defect.

3. IOL toric defining bar: Light blue button that can be moved to chose the toric IOL. The green vertical line shows the ideal point for toric IOL to reach the desired astigmatism correction while leaving the residual cylinder that is desired.

1.



4.

Lower portion of the superior half of the screen: (figure 1)

Area dedicated to show the lens that will be placed and the estimated residual refraction expected once the toric IOL is introduced.

1. **IOL Selected:** Spheric power for both bitoric IOL and with positive toricity (as described in previous paragraphs) and the axis at which it should be placed.

2. **Residual Refraction:** Expected residual refraction for:

   - Spheric equivalent.
   - Sphere.
   - Cylinder.
   - Axis.

1.

Lower central portion: (figure 2)

Presents the graphics of the different parameters calculated.

1. **Placement of the primary incision and axis of SIA induction.**

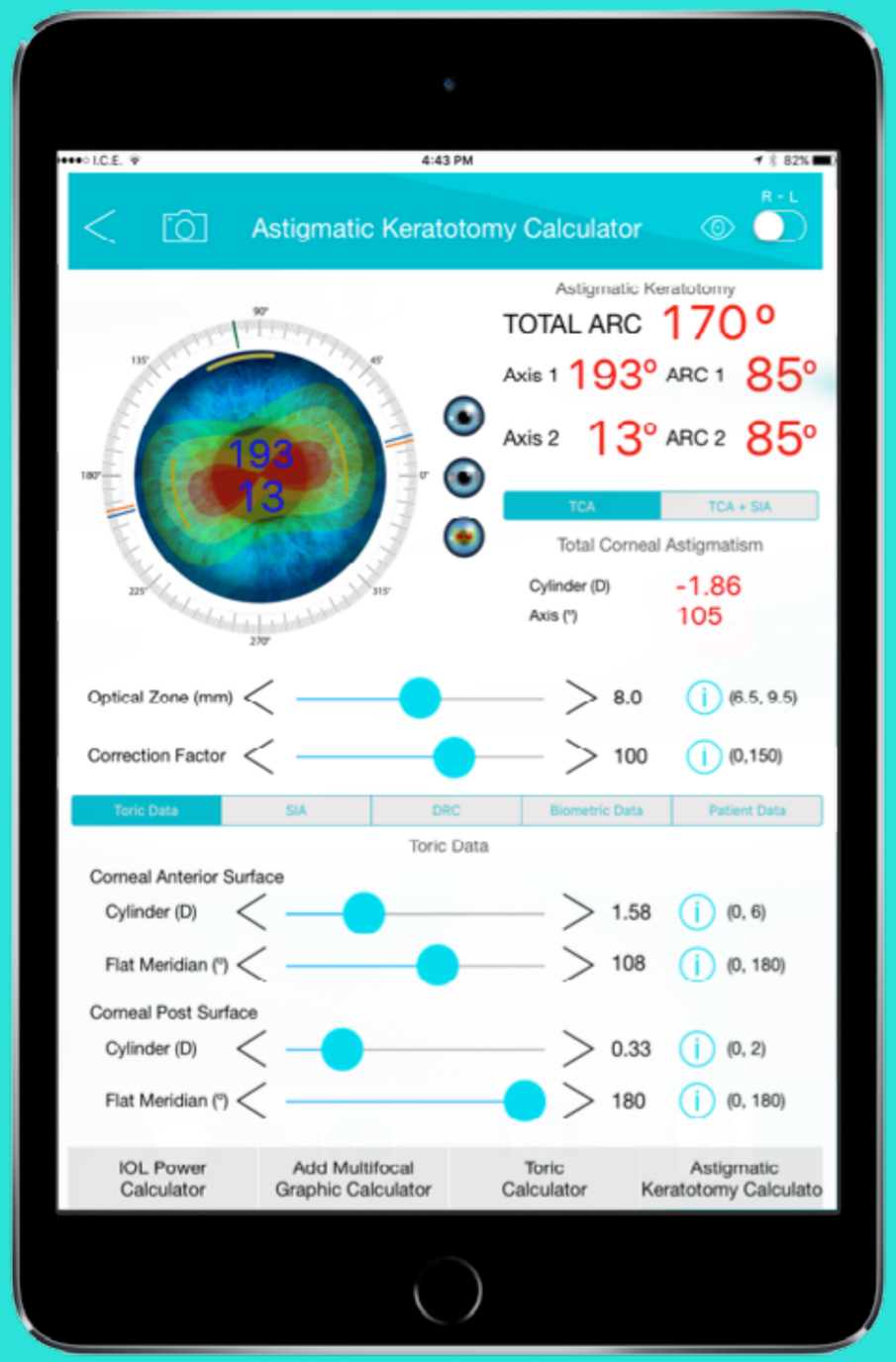
2. **Position of the toric IOL calculated.**

3. **Topographic image of the total corneal astigmatism,** which includes the sum of the anterior and posterior surface astigmatism, without the SIA or the DRC.

There is a chance of selecting the graphic images separately by pressing on the middle buttons.

2.

Astigmatic Keratotomy Calculator



This program allows the calculation of :

1. The toric power of the anterior and posterior corneal surface.

2. The total corneal astigmatism including the induced by the corneal incision.

3. Estimate the necessary power at corneal plane level to achieve the desired residual astigmatism according to the patient's age.

4. Calculate the recommended arcuate keratotomy and graph it according to age, optic zone, arc and depth.

The variables utilized by the program are:

1. Toric data: (Corneal astigmatism). (figure 1)

a. Corneal Anterior Surface:

- **Cylinder:** In diopters.
- **Flat Meridian:** In degrees.

b. Corneal Posterior Surface:

- **Cylinder:** In diopters.
- **Flat Meridian:** In degrees.

2. SIA: Surgical Induced Astigmatism: (figure 2)

a. Cylinder: In diopters.

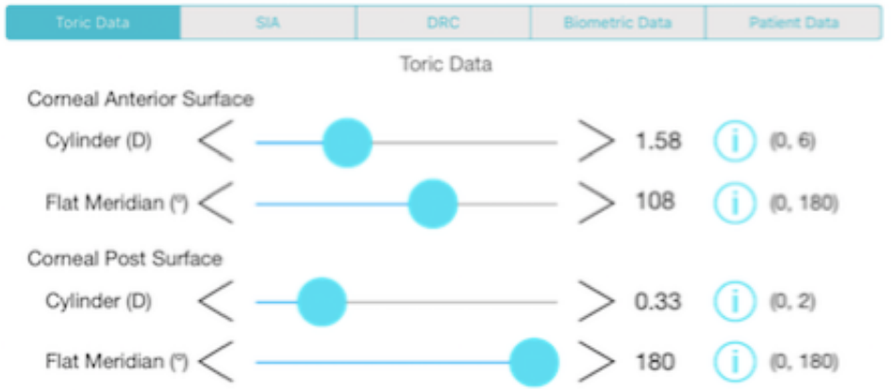
b. Axis: At which incision is made.

3. DRC: Desired Residual Cylinder: (figure 3)

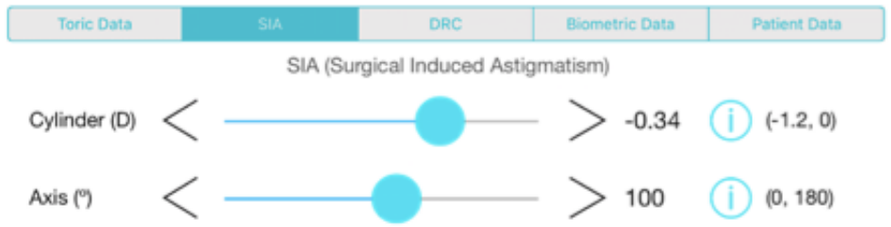
a. Cylinder: DRC once surgery is performed.

b. Axis: Axis for desired DRC.

1.



2.



3.

4. Biometric data: (figure 4)

In this space the values that were used for the IOL power calculation are reflected and don't influence the calculation of arcuate keratotomies. Includes Optical axial Length, P/A ratio.

5. Patient data: (figure 5)

Results: (figure 6)

In the superior half of the screen are the results of the calculations, with detailed information, including:

On the right portion of the screen:

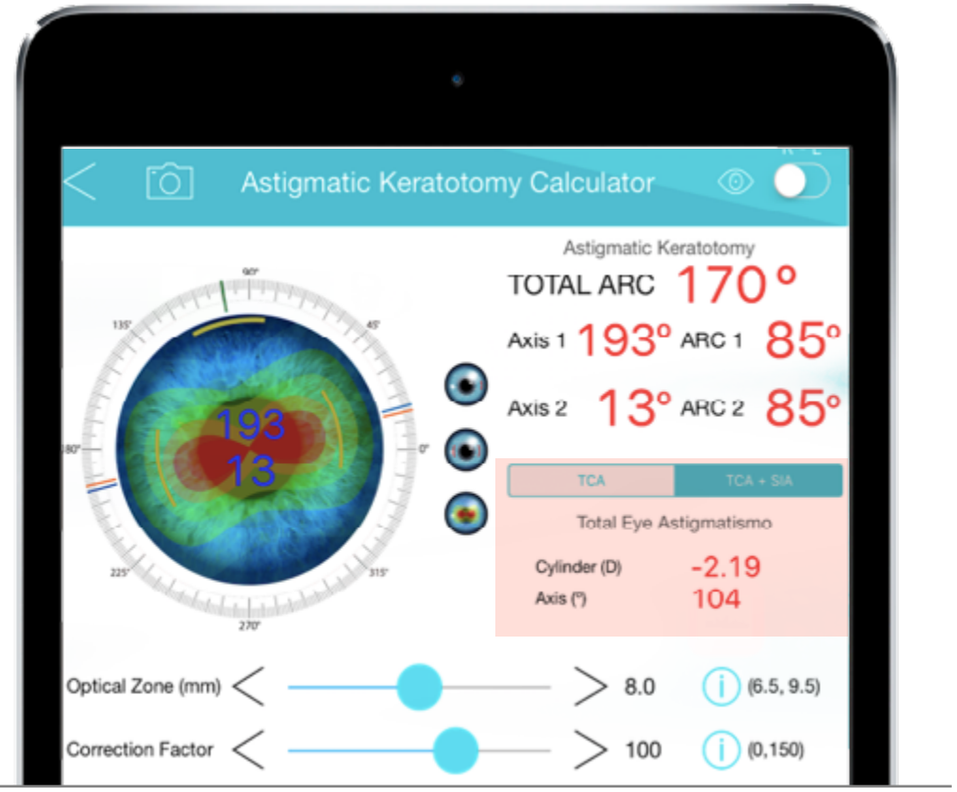
1. TCA: Total corneal astigmatism resulting of the addition of the anterior and posterior corneal surfaces. This astigmatism is at corneal plane level.

2. TCA + SIA: Corneal astigmatism to be corrected, which includes the sum of total corneal astigmatism and surgery-induced astigmatism by primary incision. This result is at corneal plane level.

4.

5.

6.



On the inferior portion of the screen: (figure 1)

There are two additional values that influence the final result for the arcuate keratotomy:

Optical Zone: Zone for planned arcuate keratotomy, with possibility of varying in 0.5 mm, from 6.5 mm to 9.5 mm.

Correction Factor: Correction factor of all the calculations to personalize the nomogram that the MD is accustomed to.

This will be done in the following way: Lets suppose that the habitual nomogram of a surgeon for correcting one diopter of astigmatism, in a 65 year old patient, produces two 45 degree arcuate keratotomies. To personalize the program we must try the correction of one total diopter (TCA+SIA), without leaving a residual (DRC), and move the Correction Factor bar, to where the program gets to 45 degrees (arc1 & arc2). By moving the bar to 122% we get the relation of 45 degrees to 1 diopter in a 65 year old patient, maintaining the 122 Correction Factor. The obtained calculation will be corrected for the individual nomogram of the surgeon, but taking into account the different toric vectors that are involved.

Left portion of the screen, presents the graphs of the different parameters calculated. (figure 2)

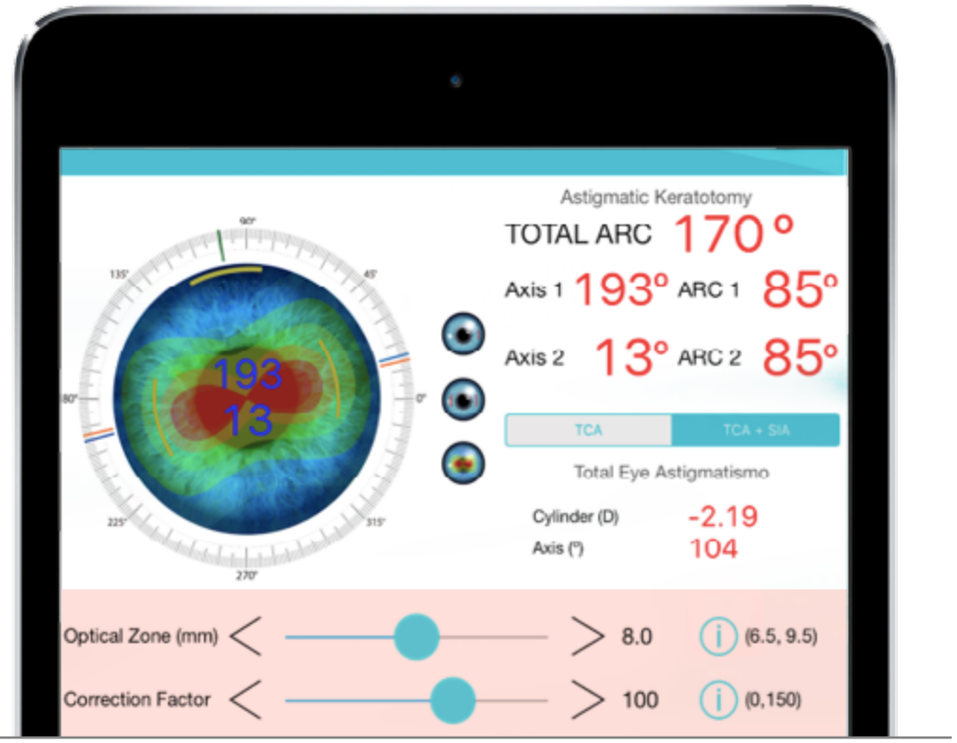
1. **Primary incision placement and axis of SIA induction.**

2. **Position of the recommended arcuate incisions.**

Topographic image of total corneal astigmatism, which includes the sum of the anterior and posterior corneal surfaces, without SIA or DRC.

There is a chance of selecting the graphic images separately by pressing on the middle buttons.

1.



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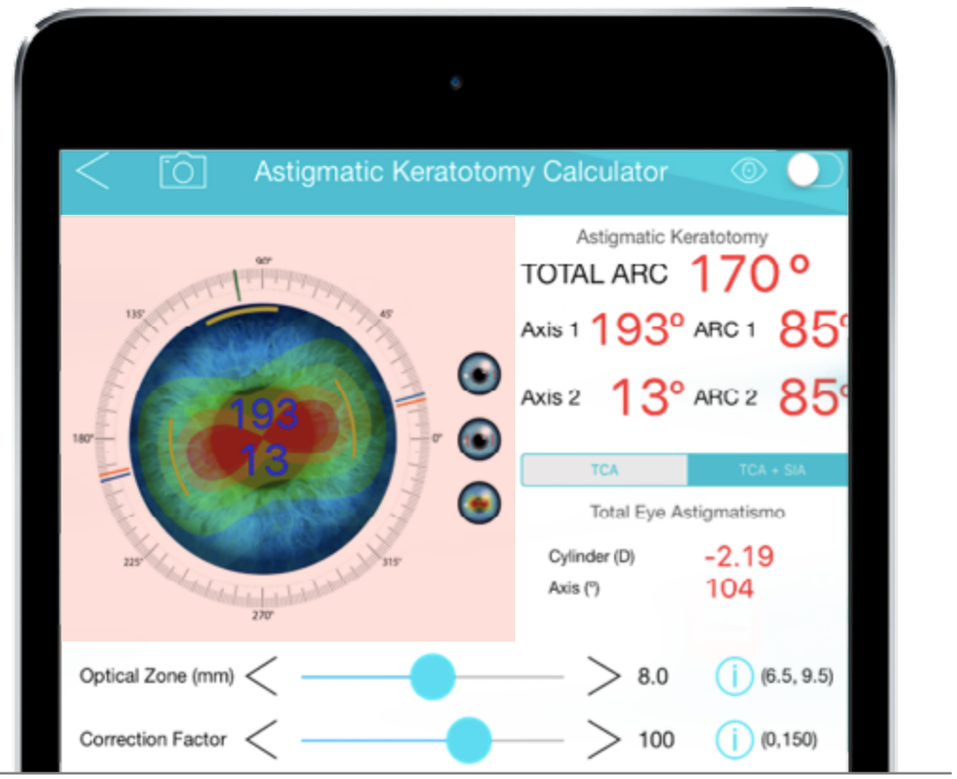
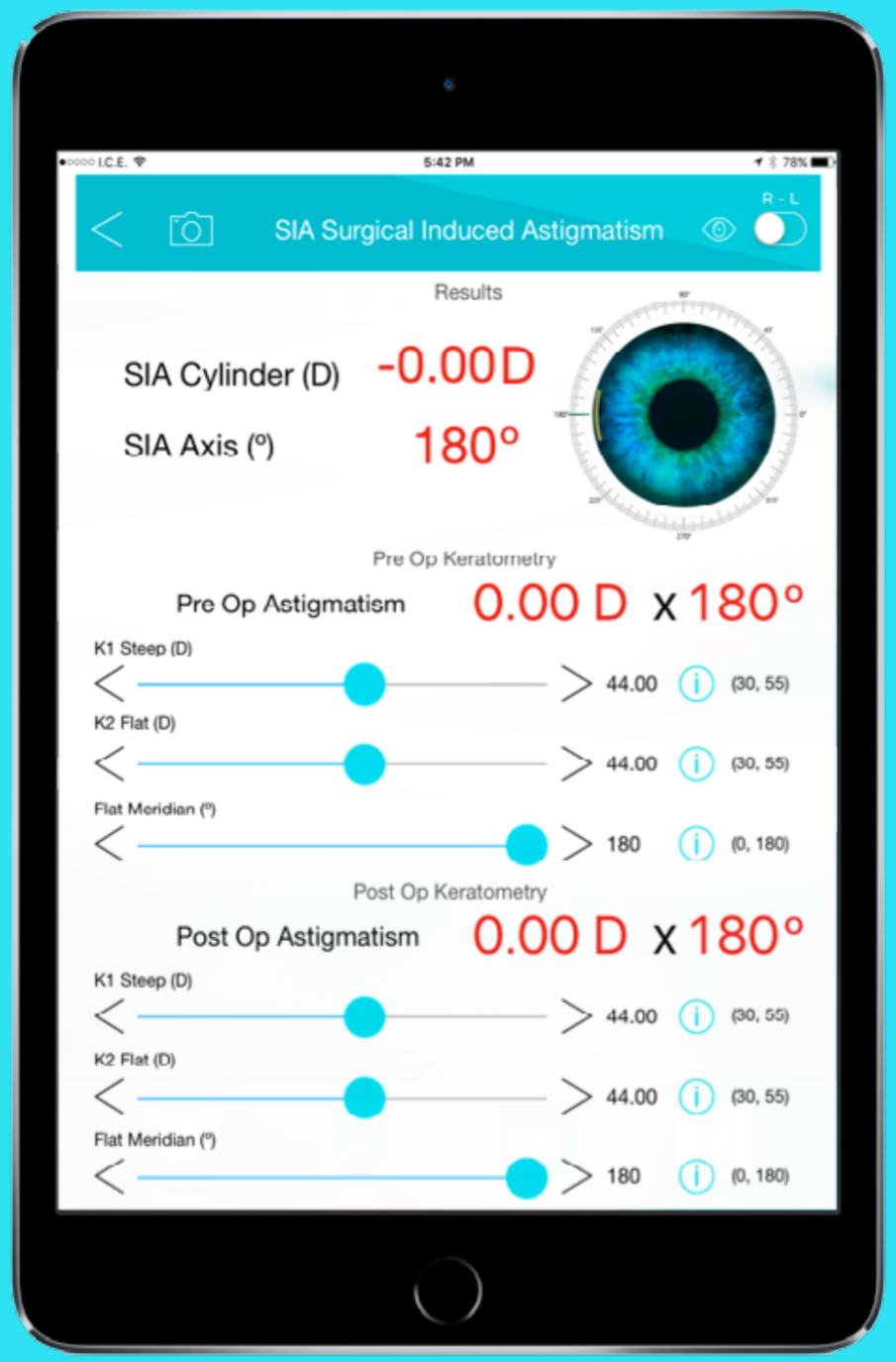


SIA Surgical Induced Astigmatism Calculator



This program calculates the surgical-induced astigmatism, using the pre and post operatory keratometries.

- **SIA Cylinder (D):** Surgical-induced astigmatism in diopters.

- **SIA Axis (º):** Astigmatic axis calculated in degrees.

Important note: All measurements must be taken with the same instrument.

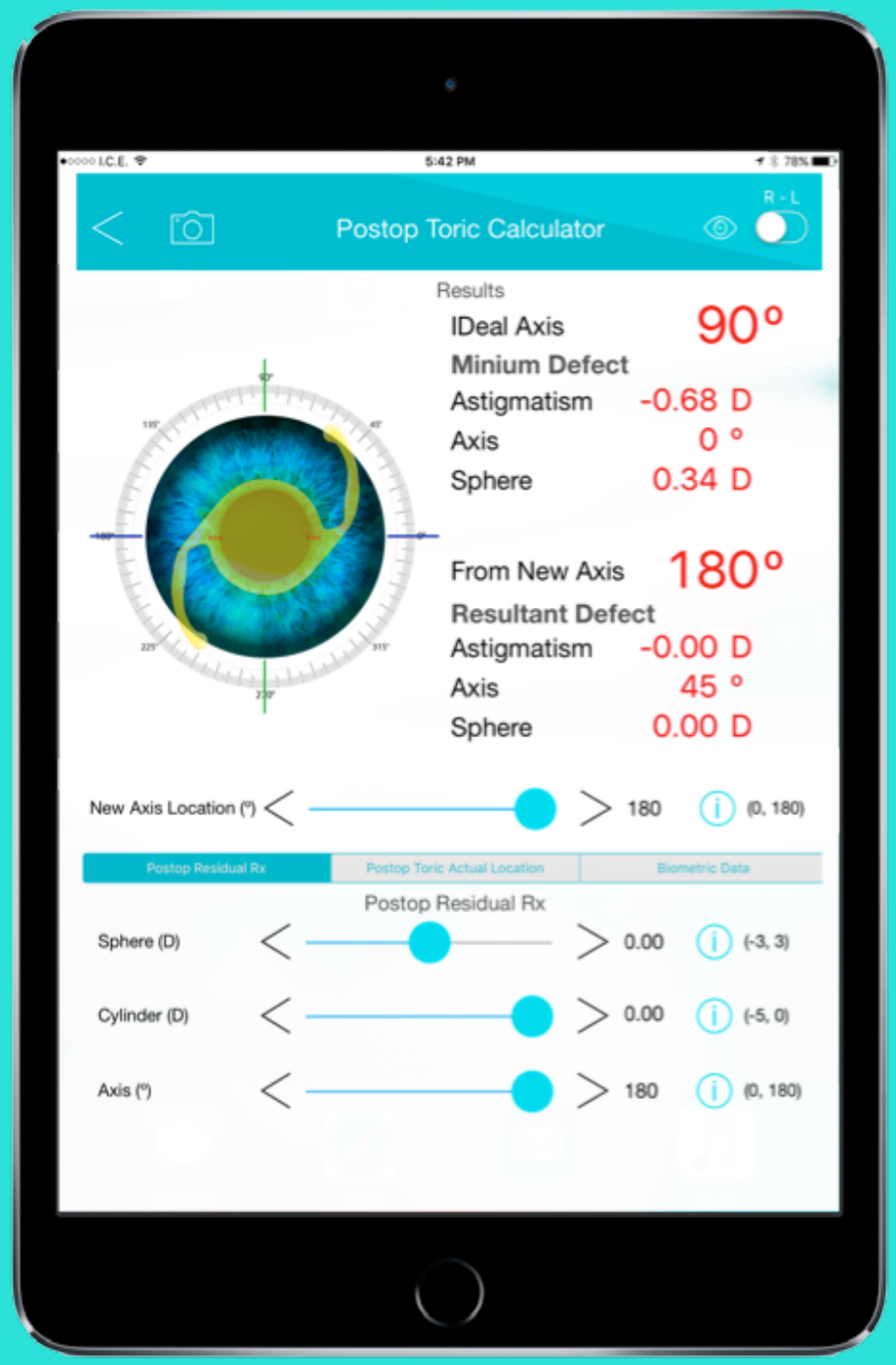
- **Pre Op Astigmatism:** Calculates the pre operatory astigmatism after stating the keratometries of:

  - **K1 Steep (D):** The steepest keratometry in diopters.
  - **K2 Flat (D):** The flattest keratometry in diopters.
  - **Flat Meridian (º):** Meridian with the flattest keratometry.

- **Post Op Astigmatism:** Calculates the post operatory corneal astigmatism, by introducing the keratometries of:

  - **K1 Steep (D):** The steepest keratometry in diopters.
  - **K2 Flat (D):** The flattest keratometry in diopters.
  - **Flat Meridian (º):** Meridian with the flattest keratometry.

Postop Toric Calculator



This program is designed to calculate the effect of the rotation of the toric IOL, on the final refraction and allows to determine which will be the ideal axis rotation, that will result in the best toric refraction.

Includes three submenus with variables, which are:

1. Postop Residual Rx: (The residual refraction after the surgery).

Must include three variables: (figure 1)

- **Sphere (D):** Sphere (with negative cylinder) in diopters.
- **Cylinder (D):** Negative residual cylinder in diopters.
- **Axis (º):** Residual cylinder axis in degrees.

2. Postop Toric Actual Location: (figure 2)

- **Toric IOL:** Toric power of the IOL at intraocular lens plane level.
- **Axis (º):** Axis at which the toric IOL marks are located.

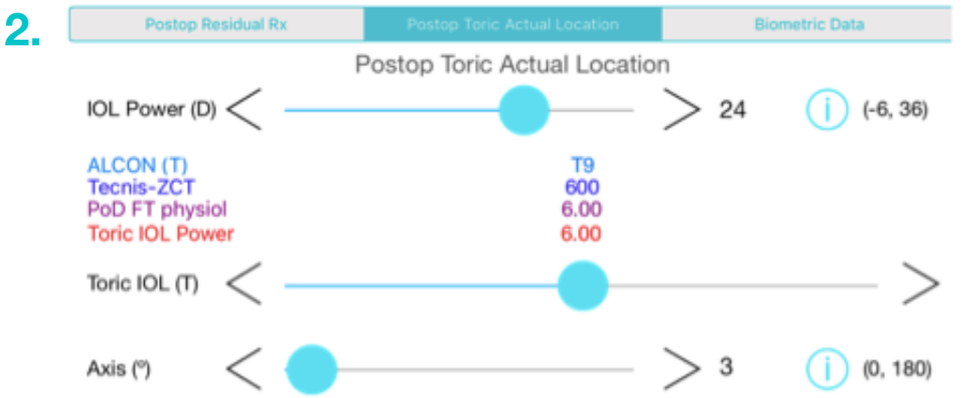
3. Biometric Data: (figure 3)

They allow the program to fix the calculation for the ELPo.

- **Optical Axial Length.**
- **Keratometry.**

1.

2.



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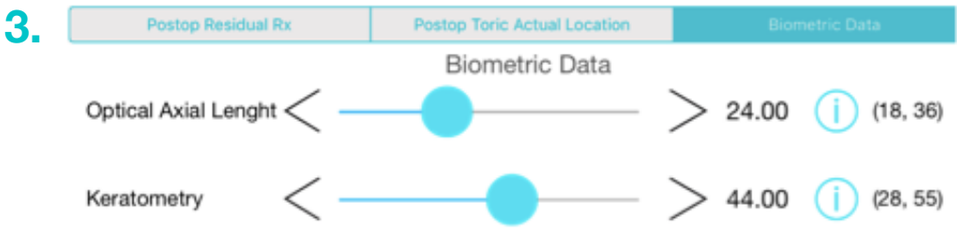


Results:

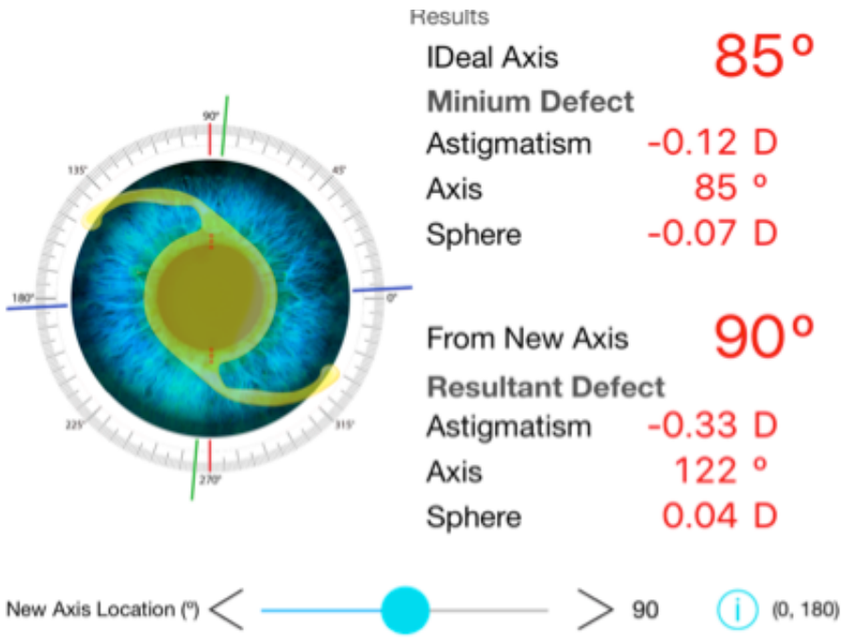
Ideal Axis:

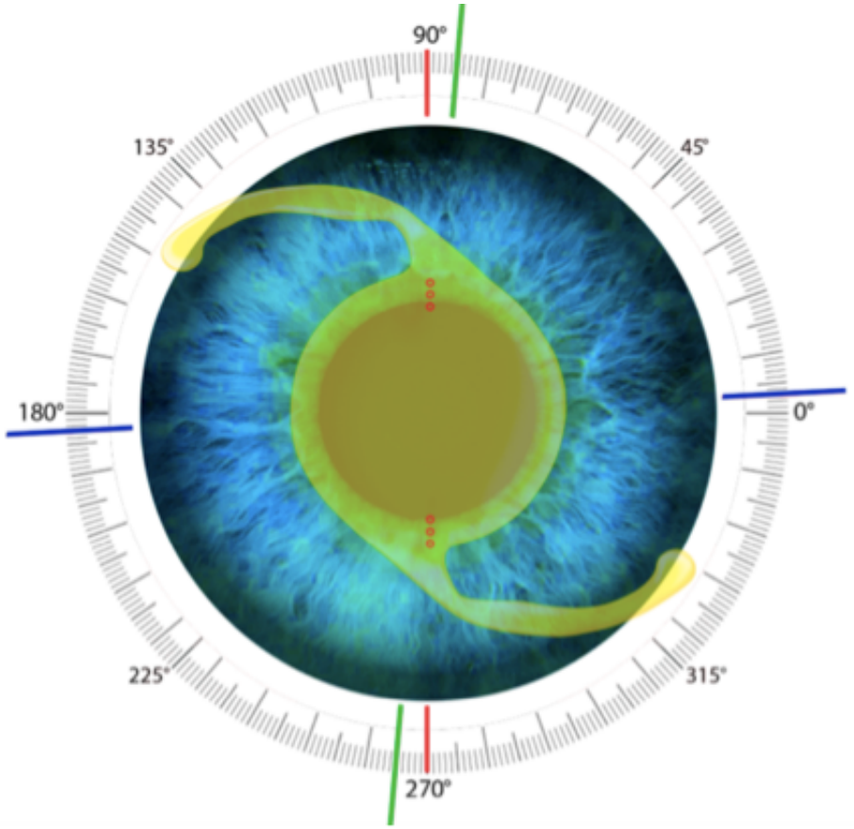
The superior right portion of the screen, shows the result of the calculation for the ideal axis rotation of the IOL, for obtaining the best residual refraction:

- **Astigmatism:** Minimal residual astigmatism.
- **Axis:** Axis of the residual astigmatism.
- **Sphere:** Minimal residual sphere.
- **From New Axis:** New axis chosen by the surgeon:

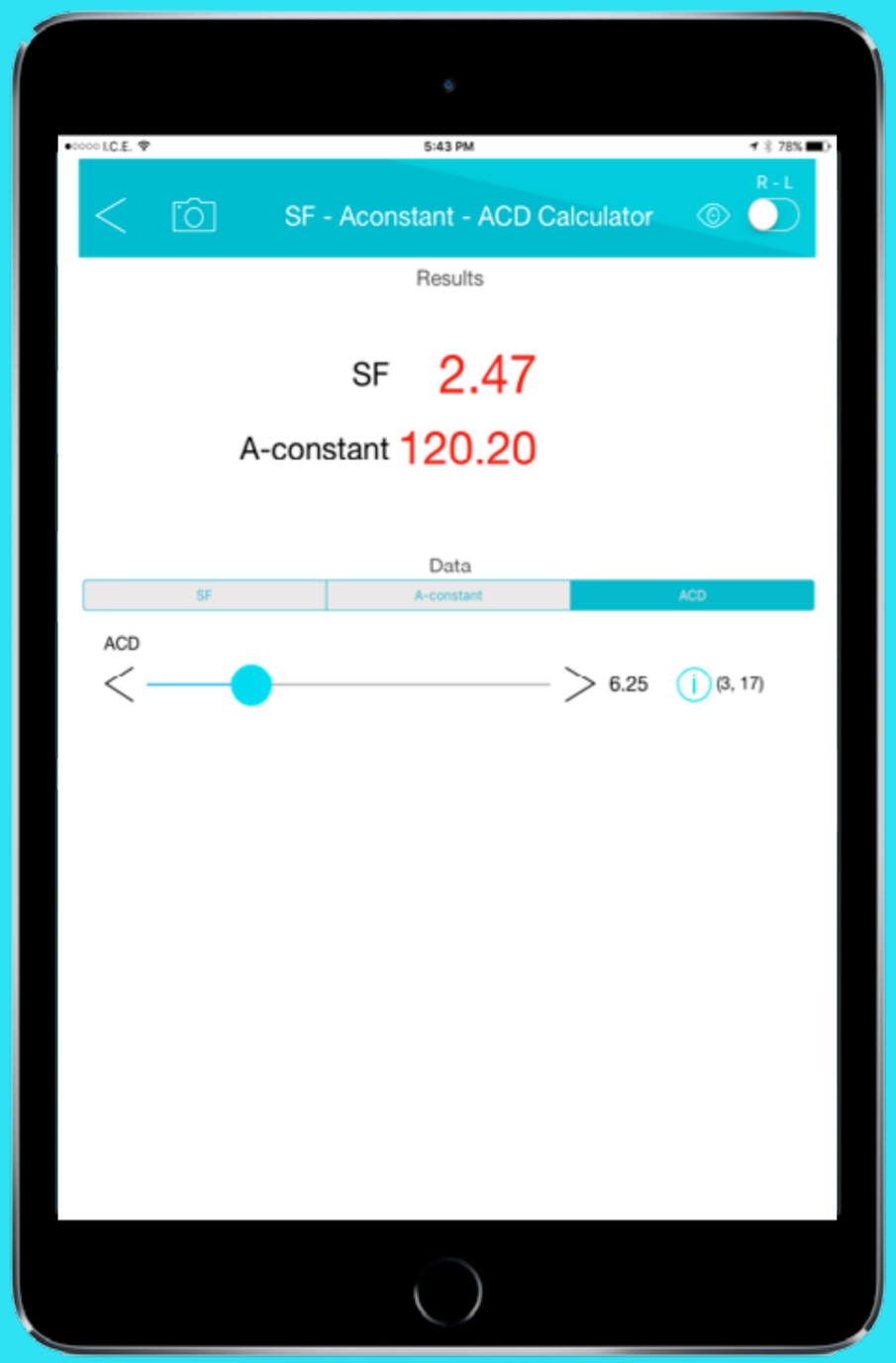
The half right portion of the screen shows the result for the axis rotation chosen by the surgeon, which would acquire the following residual refraction:

- **Astigmatism.**
- **Axis.**
- **Sphere.**
- **New Axis Location:** Bar which allows to adjust the axis of rotation chosen.





SF – Aconst - ACD Calculator



Constant Calculator

This option allows the calculation of the different constants, when one of them is known.

The variables are:

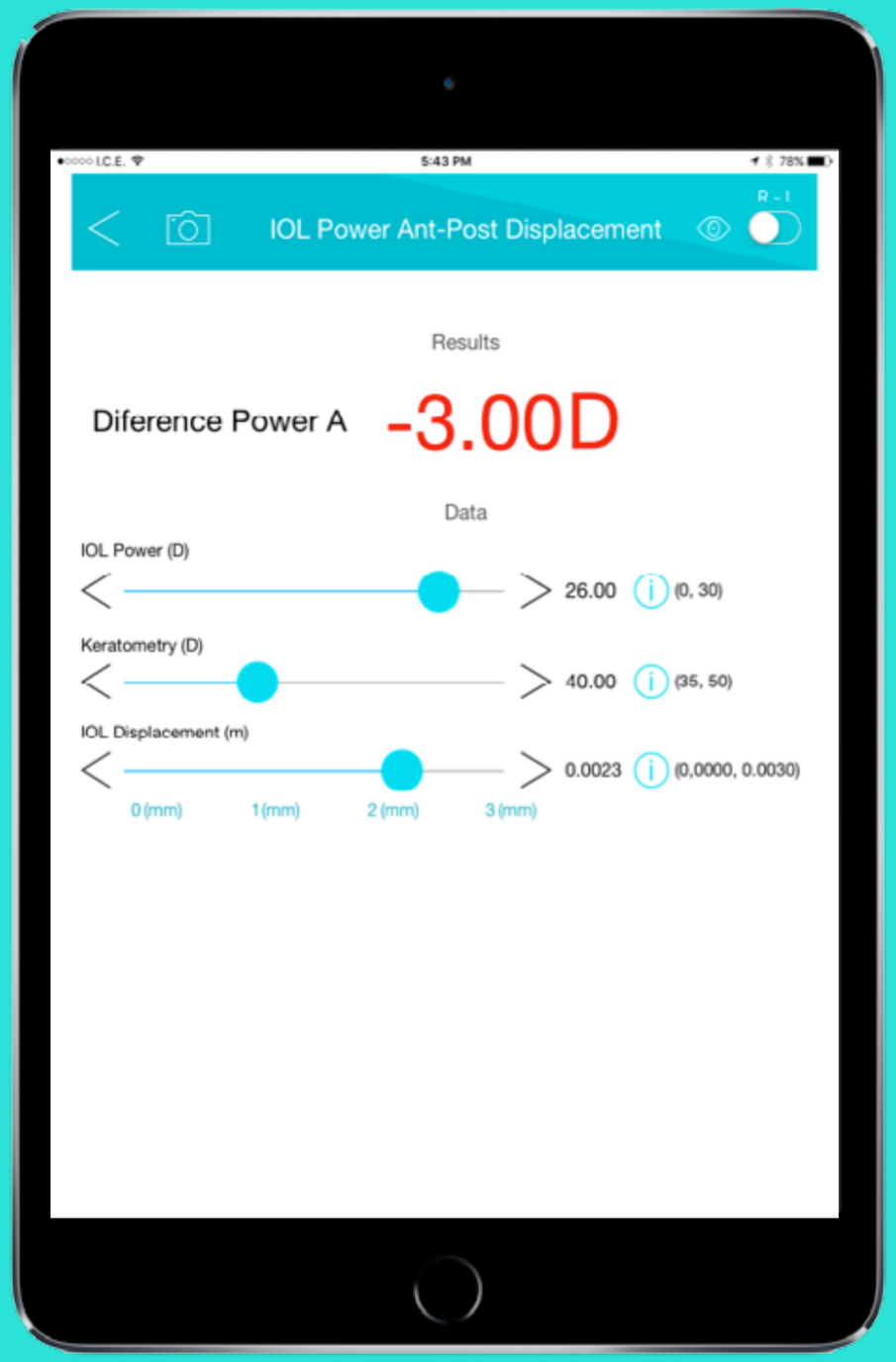
1. **SF (Surgeon Factor).**

1. **A.Const for SRK.**

1. **ACD (Anterior Chamber Depth).**

IOL Power Ant-Post Displacement

Calculates the change in the relative power of the IOL when displaced in anterior or posterior direction.

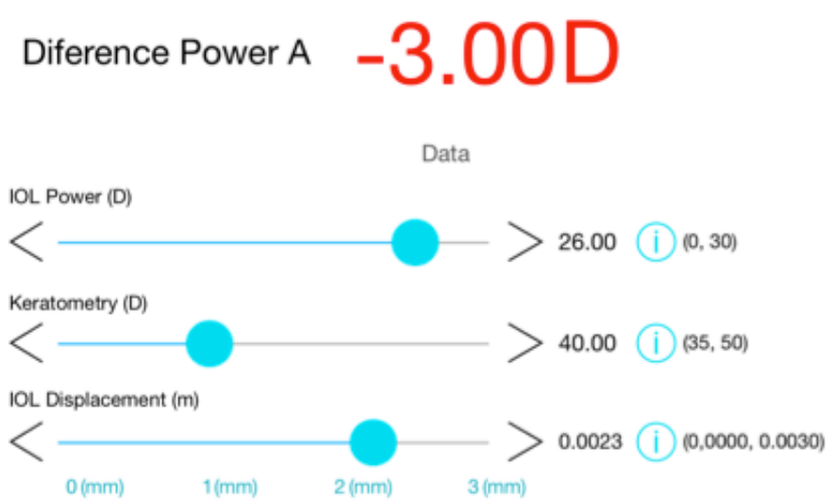


The variables are:

1. **IOL Power (D).**

2. **Keratometry (D).**

3. **IOL Displacement (m):** If the displacement is positive there is an increase in the IOL power (in positive power IOLs) and there is a loss of power when the displacement is posterior.

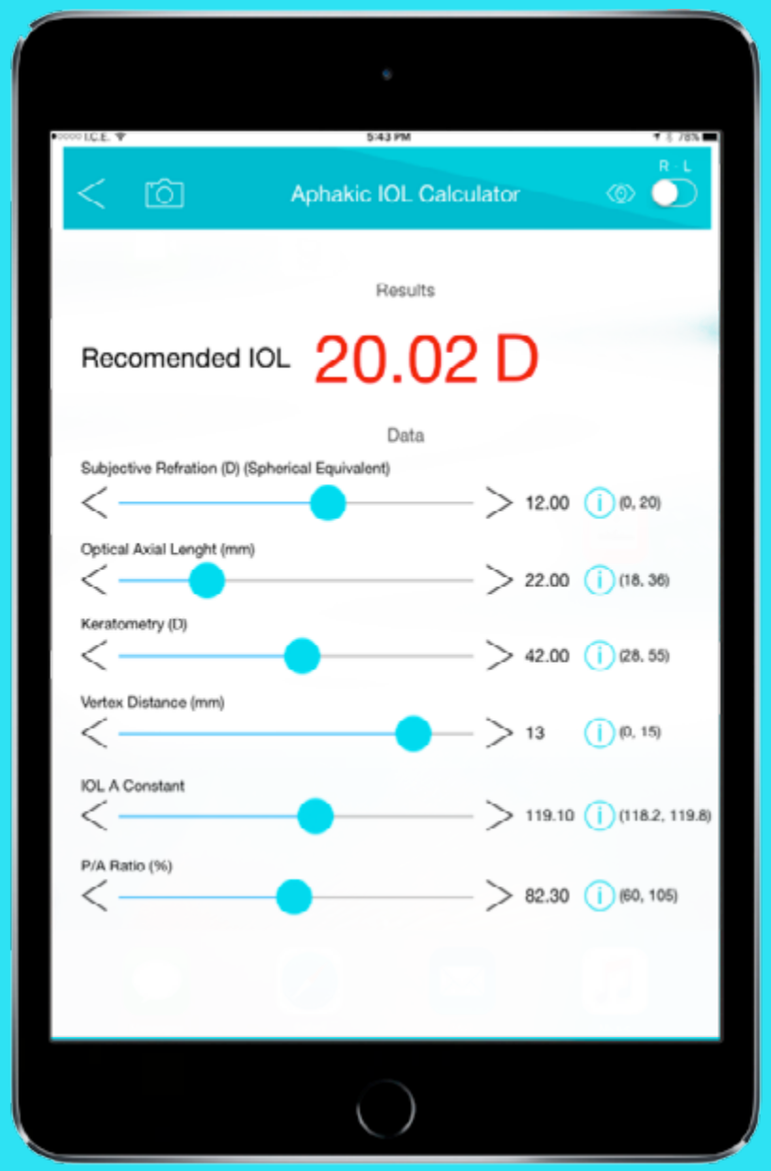


Aphakic and Phakic IOL Calculator

Aphakic IOL Calculator

Calculator for IOL in aphakia (Absence os intraocular lens or crystalline).

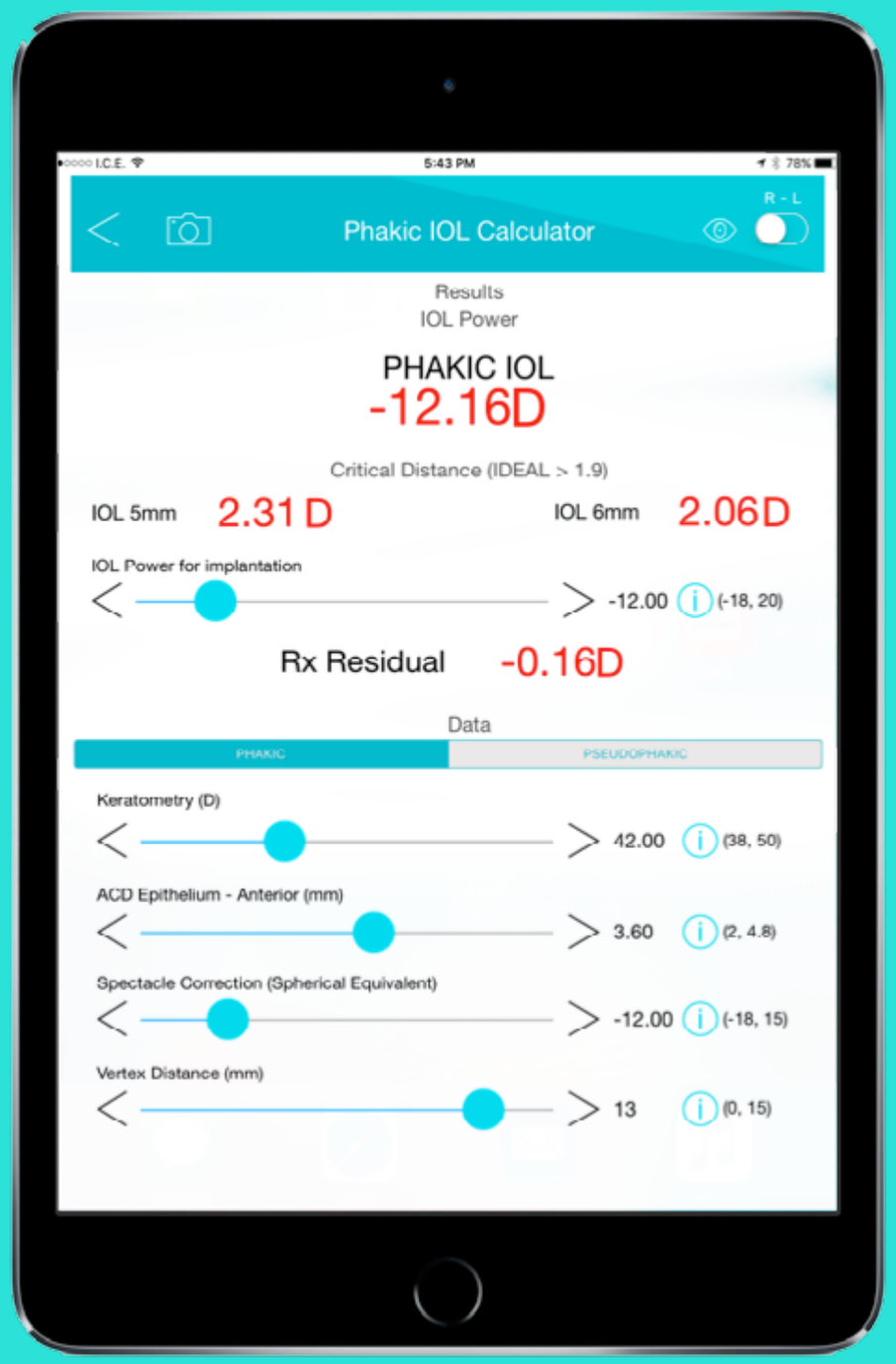
Based primarily in the subjective refraction in aphakic state, using other variables that increase predictability to improve the effective position of the IOL that will be introduced in the sulcus.



The variables are:

1. **Subjective Refraction (D)(Spherical Equivalent).**
2. **Optical Axial Length (mm).**
3. **Keratometry (D).**
4. **Vertex Distance (mm).**
5. **IOL A Constant.**
6. **P/A Ratio (%).**

Phakic IOL Calculator



Calculator for phakic anterior chamber lenses such as Irisclaw, phakic and pseudophakic.

In the case of phakic IOL, there needs to be a certain power to correct the desired defect, and the critical distance to the endothelium are calculated for two different diameter IOLs: 5mm and 6 mm.

The program allows the introduction of the IOL power and calculates the residual for the expected spheric equivalent.

The variables taken into account are the same for the phakic lens as for the pseudophakic lens.

The variables are:

Phakic: for the calculation of phakic IOL:

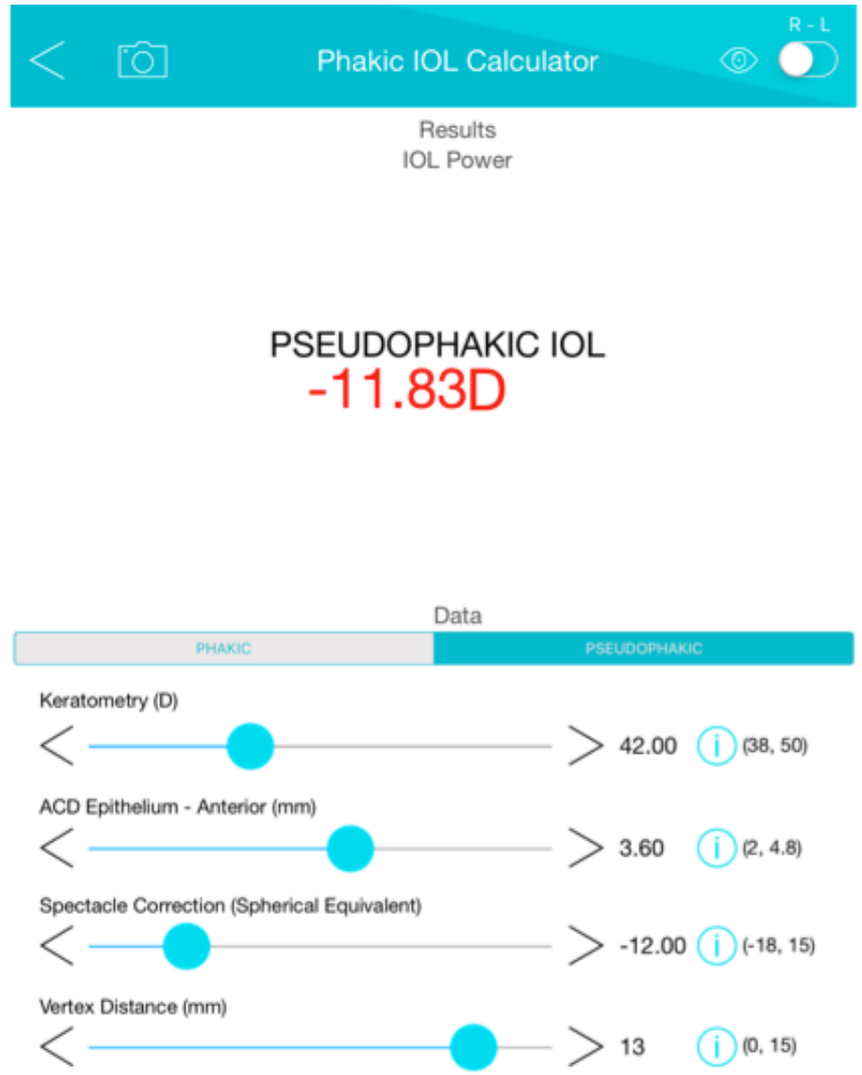
1. Pseudophakic: for the calculation of an anterior Iris Claw IOL, in case of residual pseudophakia.

2. Keratometry (D).

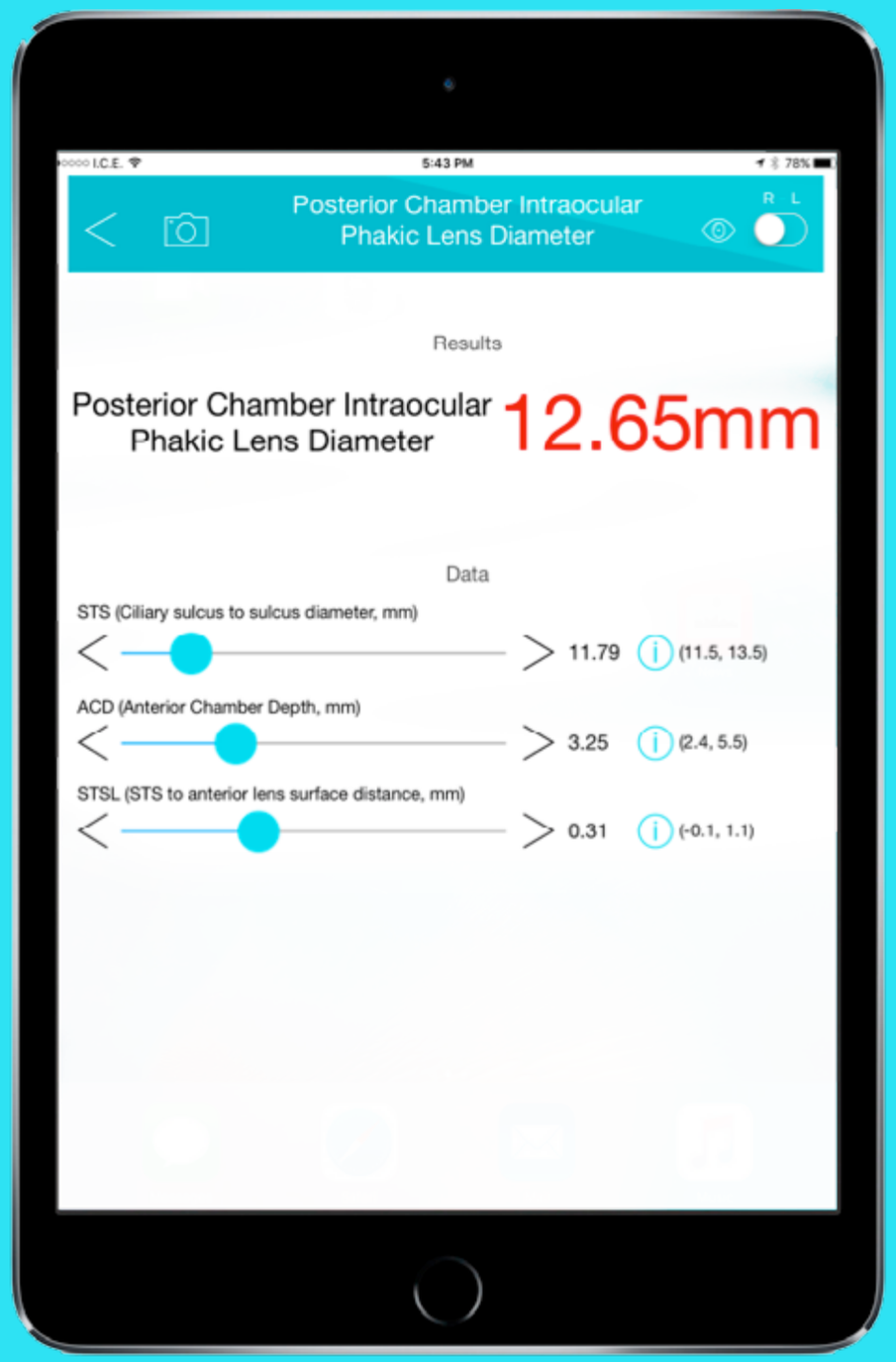
3. ACD Epithelium-Anterior (mm): Distance of the anterior chamber from corneal epithelium to the anterior capsule of the crystalline lens.

4. Spectacle Correction (Spherical Equivalent).

5. Vertex Distance (mm): Distance from the vertex to the cornea of the calculated spectacle correction.



Posterior Chamber Intraocular Phakic Lens Diameter



Diameter calculator for the posterior chamber phakic lens:

Based on the measurements taken by UBM of sulcus-sulcus diameters and the distance above the level of this line and the anterior surface of the crystalline lens (STSL).

The variables are:

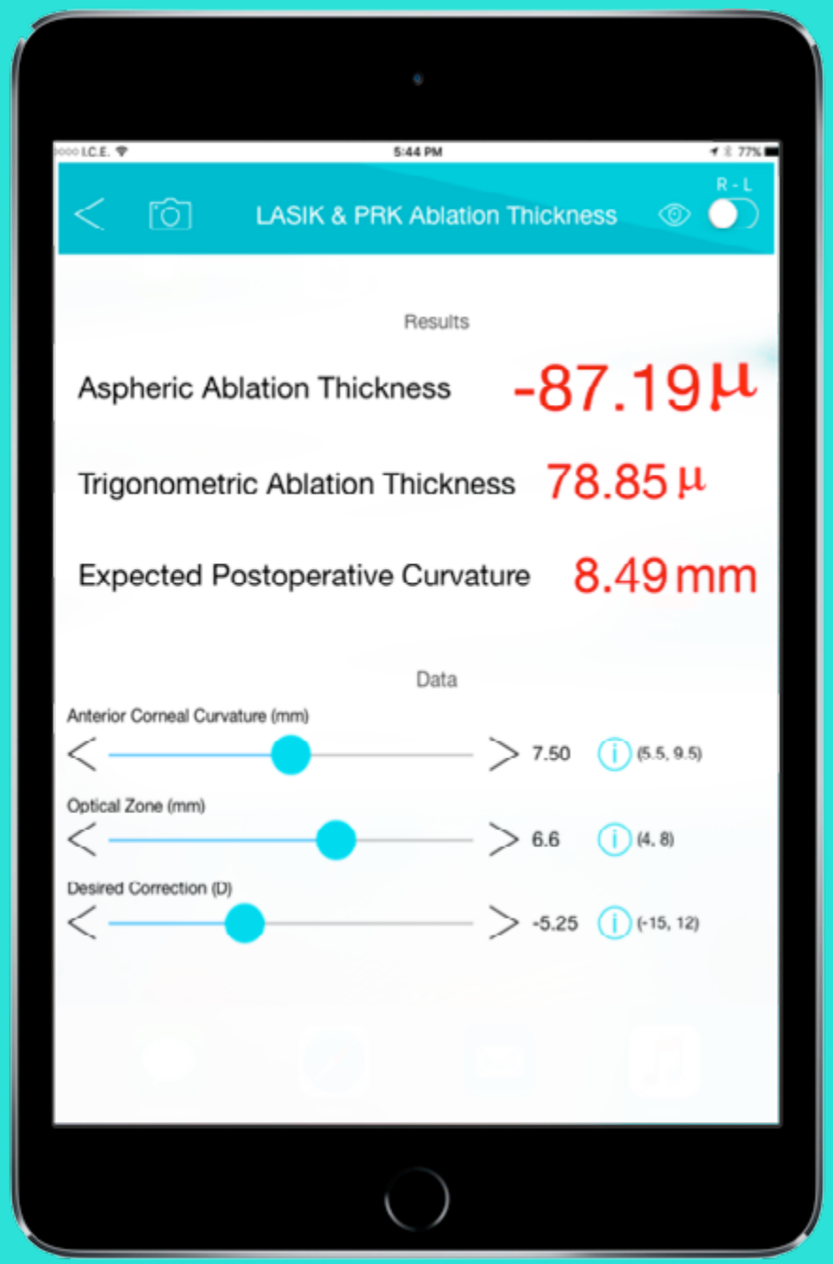
1. **STS (Cilliary sulcus to sulcus diameter in mm):** In the horizontal meridian taken with the UBM.

2. **ACD (Anterior Chamber Depth, mm):** Depth from the epithelium to the anterior capsule of the crystalline as measured by UBM.

3. **STSL (STS to anterior lens surface distance, mm):** Distance in mm between the plane that forms amid STS and the anterior capsule of the crystalline, by UBM.

Lasik & PRK Ablation Thickness Calculator

Calculated the thickness of ablation necessary for Lasik or PRK as well as the diameter of treatment.



The variables are:

1. **Anterior corneal curvature (mm).**

2. **Optical Zone (mm).**

3. **Desired Correction (D).**

Results:

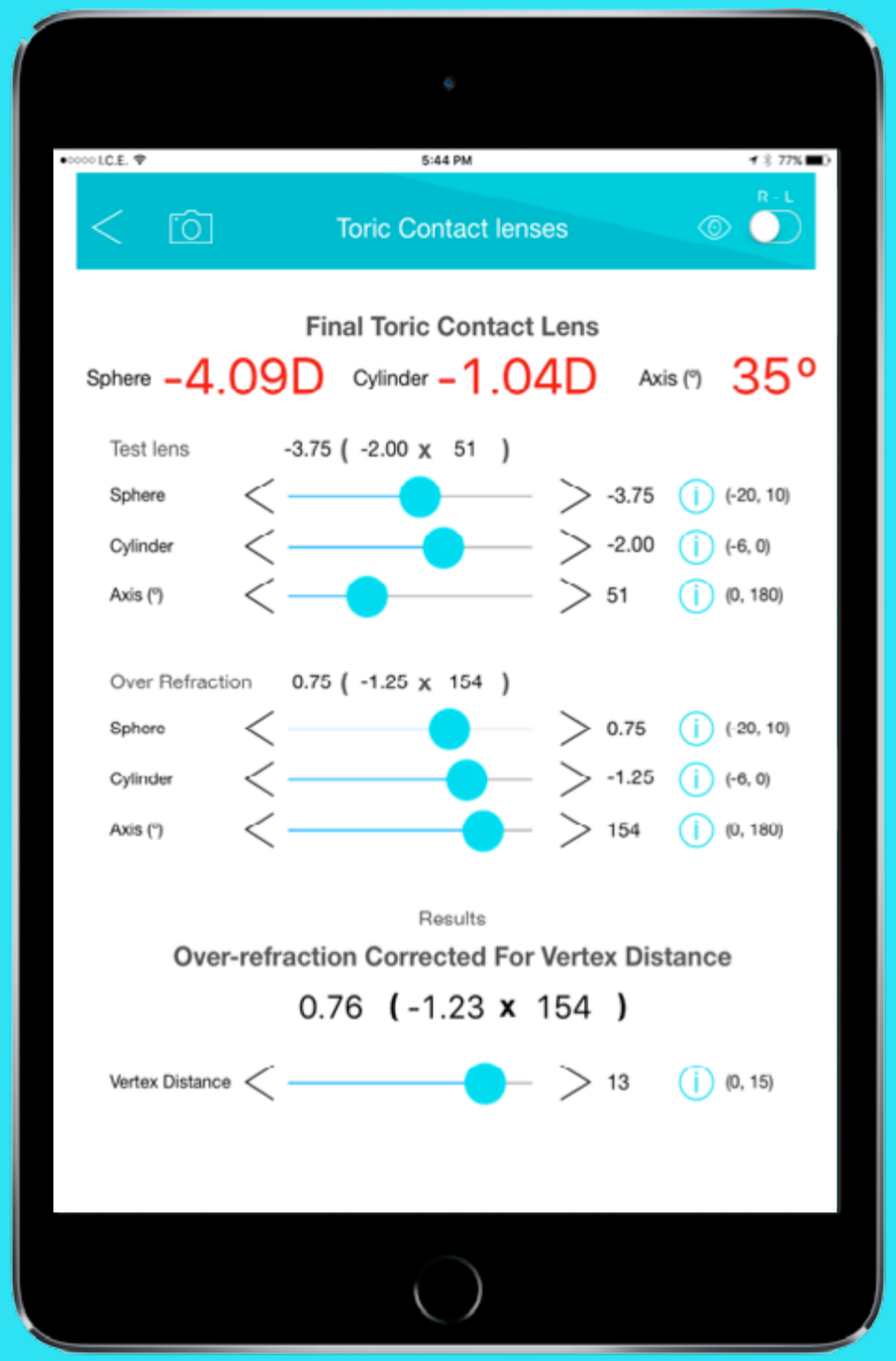
• **Aspheric Ablation Thickness:** Calculated in microns, taken in the center of myopic corrections, and in the periphery in hyperopic corrections.

• **Trigonometric Ablation Thickness:** Calculates the ablation thickness by using trigonometric formulas.

• **Expected Postoperative Curvature:** Curvature radius of the anterior surface expected to be attained after the ablation.

Optometric Formulas Calculator

Toric Contact Lens Calculator



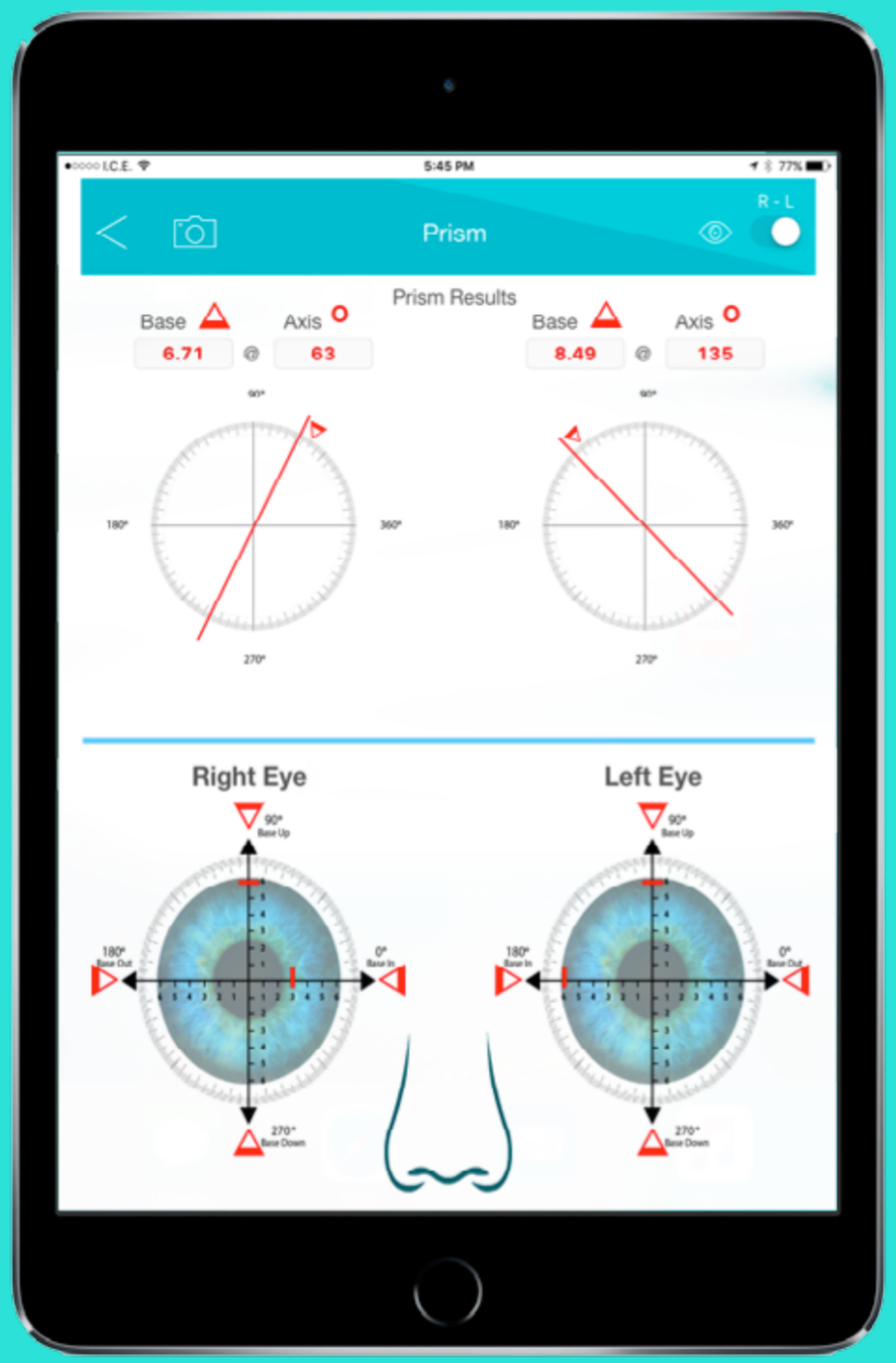
This option allows the surgeon to calculate the power of the toric lens, based on a toric contact lens and the over refraction.

- **Test Lens:**
  - **Sphere D:** Of the toric lens.
  - **Cylinder D:** Negative cylinder of the lens.
  - **Axis (º):** Negative cylinder axis of the lens in degrees.
- **Over Refraction:**
  - **Sphere D:** Of the over refraction.
  - **Cylinder D:** Negative cylinder of the over refraction.
  - **Axis (º):** Negative cylinder axis of the over refraction in degrees.
  - **Vertex Distance:** Distance of the vertex at which the over refraction is produced (in mm).

Results:

- **Final Toric Contact Lens:** Power of the contact lens needed.
- **Sphere:** Sphere of the toric contact lens.
- **Cylinder:** Negative cylinder power in D.
- **Axis:** Axis of the negative cylinder in degrees.

Prism Calculator

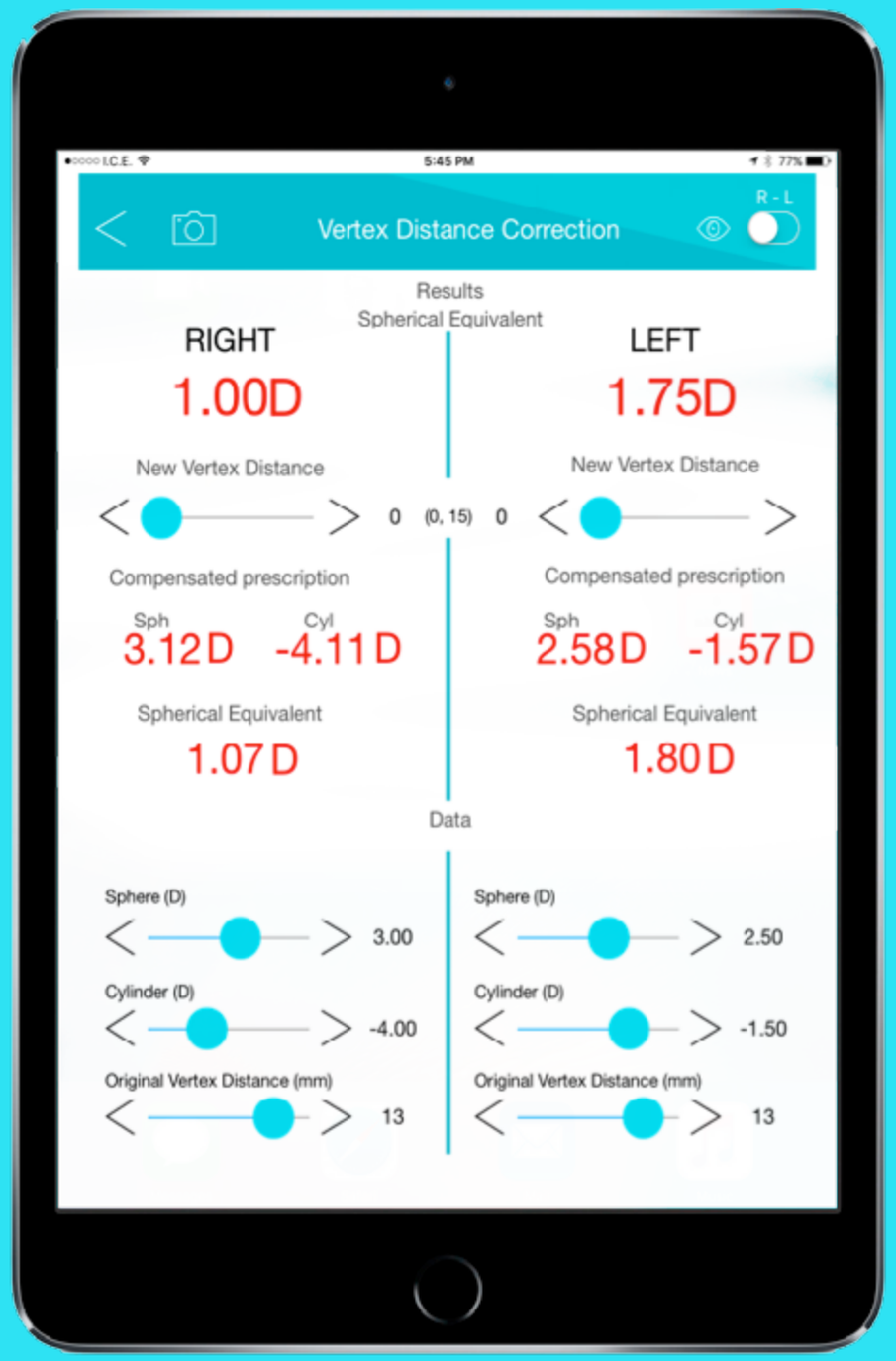


Add calculator of vertical and horizontal prism.

This calculator works in a graphic way. Allowing to place in the inferior portion of the chart the horizontal prisms with internal or external base and vertical prisms with superior or inferior base, for both eyes. Giving a result equivalent to one prism.

Vertex Distance Correction

Sphero-cylindric power calculator at vertex distance.



Calculator that allows power correction in both directions of a sphero-cylindric formula according to the vertex distance.

In the inferior portion, the sphero-cylindric base formula is inserted, along with the vertex distance in which it lays.

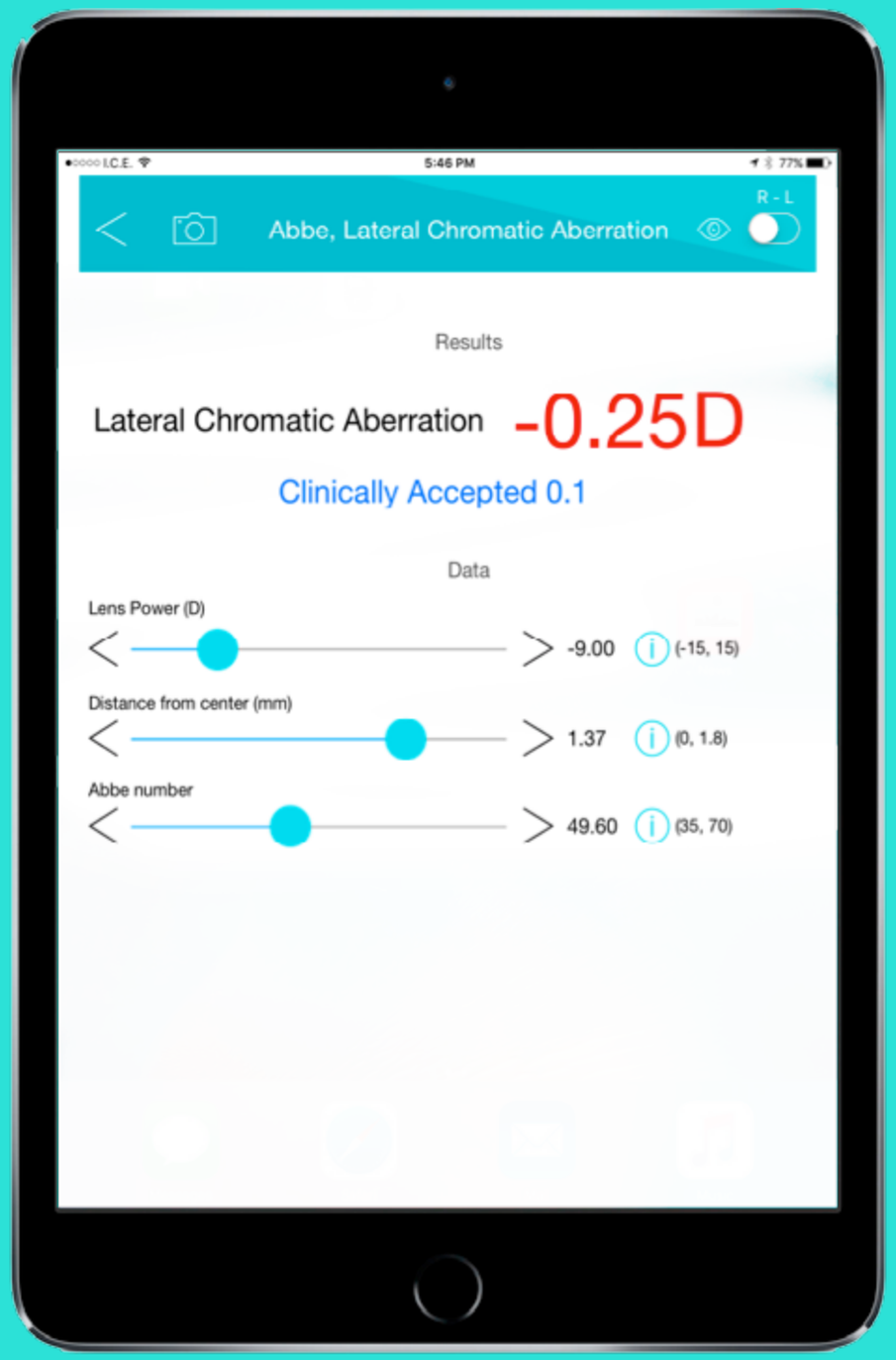
- Sphere (D).
- Cylinder (D).
- Original Vertex Distance (mm).

In the superior portion you input the new vertex distance desired.

As a result, you obtain a prescription with the vertex distance compensation and the new spherical equivalent.

- Sphere (D).
- Cylinder (D).
- Spherical Equivalent.

Abbe, Lateral Chromatic Aberration



Calculates the chromatic lateral aberration of a lens, knowing the power of the lens, the distance from the optic center and the Abbe number of the lens material to be used.

The variables are:

1. Lens Power (D).

2. Distance from center (mm).

3. Abbe number.

Clinically acceptable if it is under 0.1 D

Glaucoma IOP - Pach - K

Glaucoma IOP – Pach – K

This program uses different formulas and nomograms for the correction of the intraocular pressure with the Goldman tonometer, according to the following variables (depending on the formulas):

- Corneal Curvature (mm).
- Goldmann IOP (mmHg).
- Age.
- Corneal Thickness.

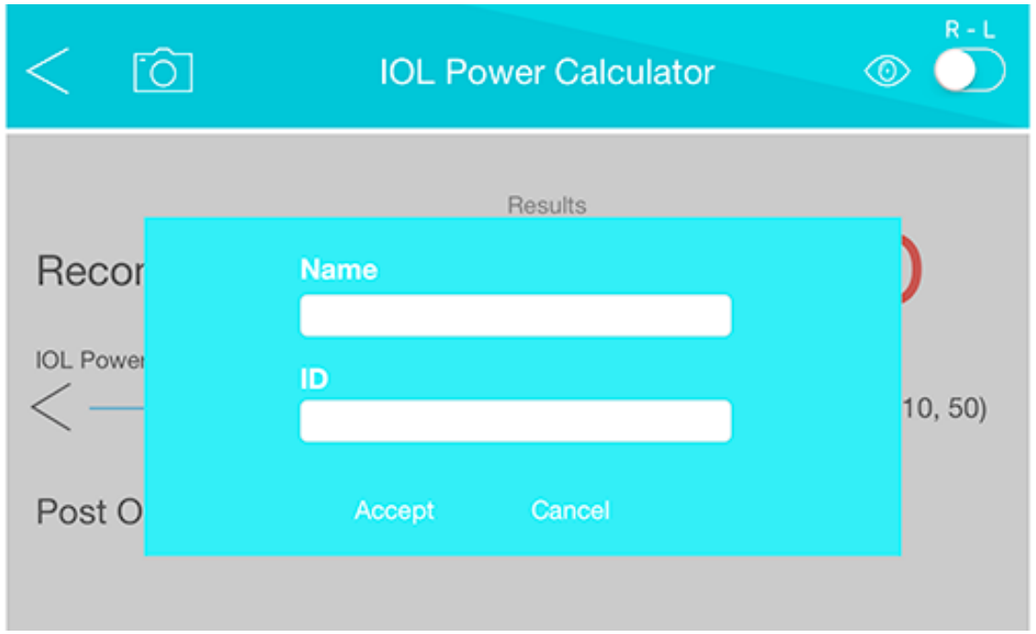
Results:

How to save and print results:

How to save and print results:

The camera icon, in the upper left corner on every screen, allows to save the results on the program in use, with all the variables for that program. It opens a small screen where the name and ID number of the patient can be included.

The graphic file is save as a picture in the IPad Photos software, where you can open the photo file, and print it or send it by email



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All the biometry formulas present in the Panacea IOL and Toric calculator are only intended to be aids in the determination of the Intraocular Lens power required for cataract or lens surgery. The choice of the IOL type and power to be implanted in the eye is ultimately the SOLE responsibility of the appropriate medical professional.

All the formulas present in this Application have been extensively checked and tested. Errors are however possible and in the unlikely event that the user notices any abnormality, it is the User's responsibility to immediately stop using the Application and report it to the following address, panaceaiolcalculator@panaceaiolcalculator.domain.com

Errors may arise if incorrect inputs are entered in the input fields. If the User needs to use a decimal number, the User must always use the "." rather than "," sign. If a field is left blank or the User enters anything other than numbers, the Program will assign an unexpected value to the input and the result will consequently be inaccurate.

Ideally, Axial Length and Keratometric values, should be measured with the Lenstar®, Corneal asphericity, P/A relation, posterior astigmatism values, should be measured with the Pentacam™. Customized rather than the labeled IOL A-Constants should be used for greater accuracy. Calculation accuracy is not guaranteed should other instruments be used to take these measurements.

This Application is neither FDA, nor CE approved.

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For technical support contact: panaceaiolcalculator@panaceaiolcalculator.domain.com

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