Introduction to Fitting Paragon CRT & CRT Dual Axis

Certification Training

Leah Johnson, OD, FAAO

Director, Global Professional Services, Paragon Vision Sciences

Clinical Adjunct Professor, University of Houston

US FDA Approval – 2002

First to receive FDA market approval for orthokeratology overnight wear – June 2002

Approval includes myopia correction:

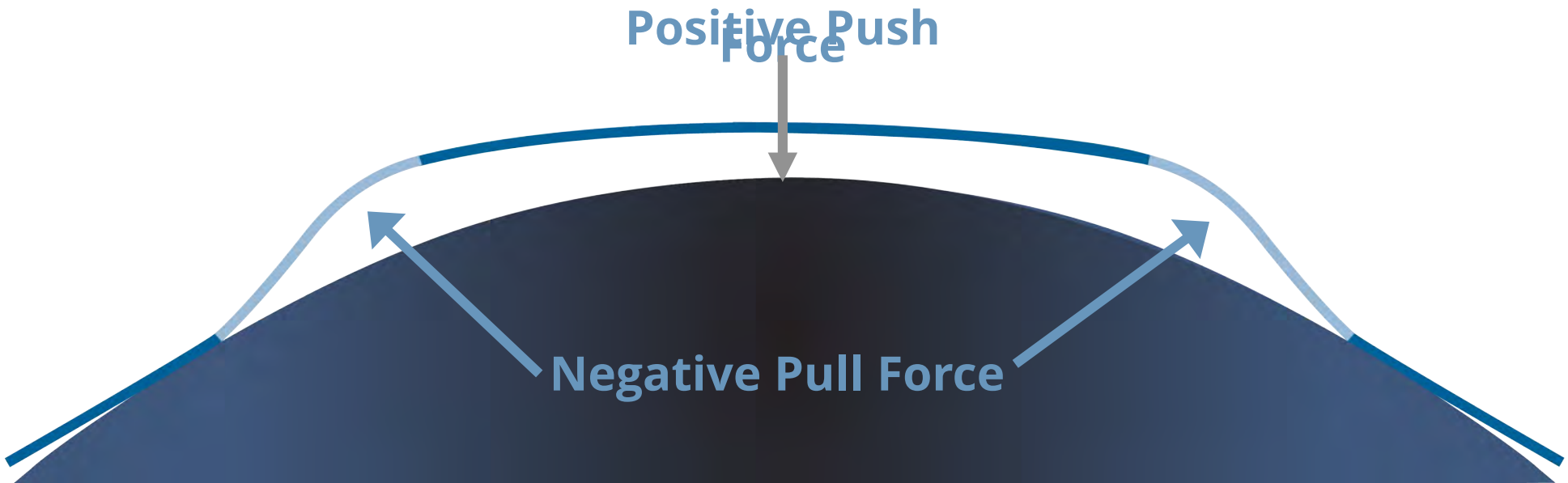
- up to –6.00D
- with or without astigmatism
- up to –1.75D of astigmatism
- **NO AGE RESTRICTIONS**

This is the **highest** range of approval for any ortho-k lens

How Does OrthoK work?

Hydraulic Forces in Closed Eyelid Environment

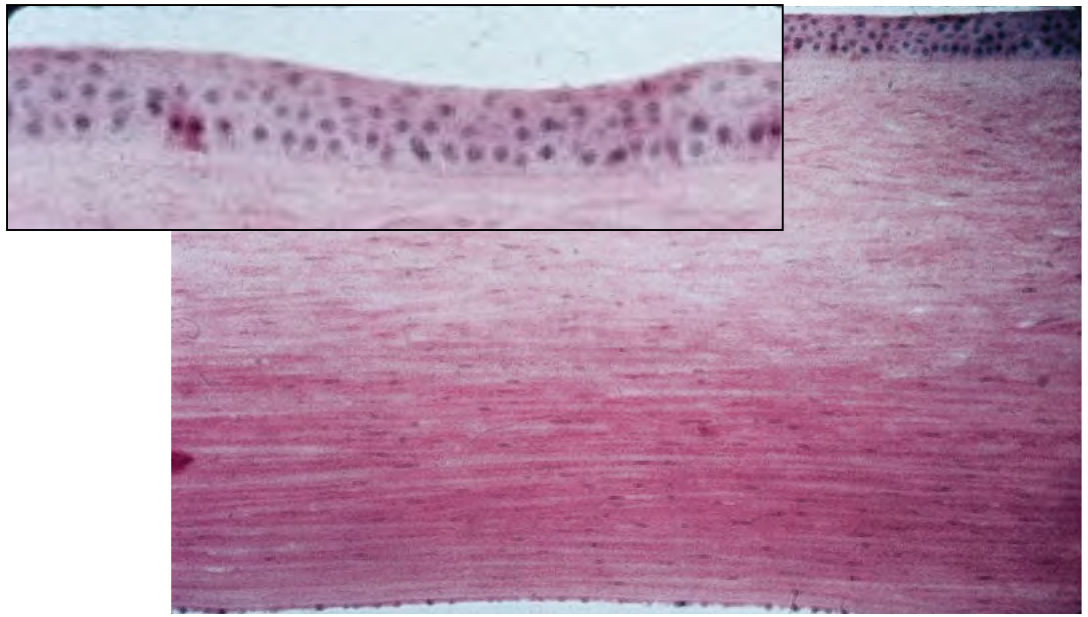
- Positive (Push) Force applied to BC
- Negative (Pull) Force in the Return Zone



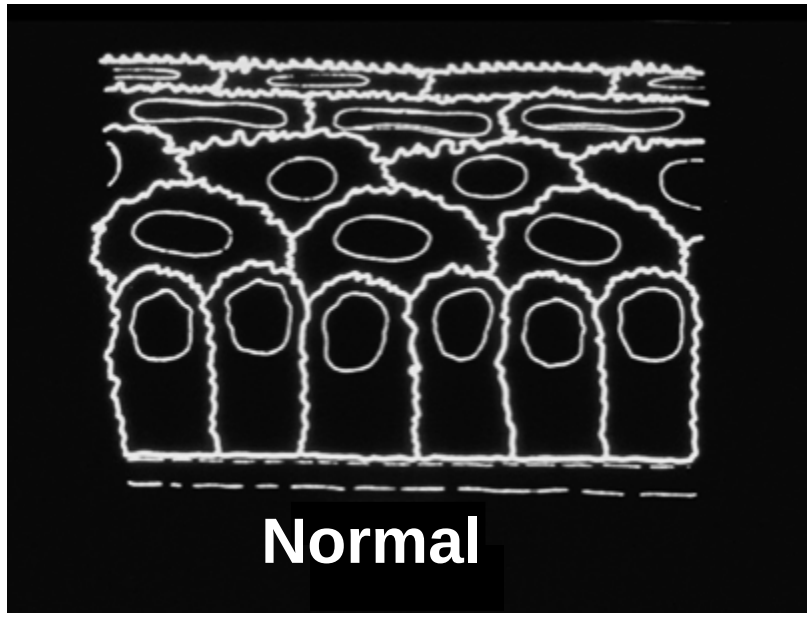
Normal Human Cornea

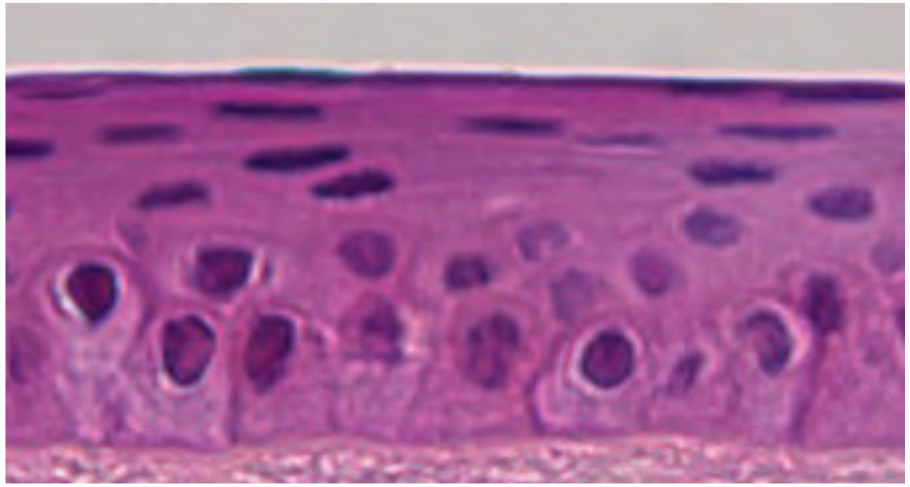
Layer	Average Thickness of Central Cornea
Epithelium	**50 Microns**
Bowmans Layer	10 Microns
Stroma	465 Microns
Descemets Membrane	10 Microns
Endothelium	5 Microns

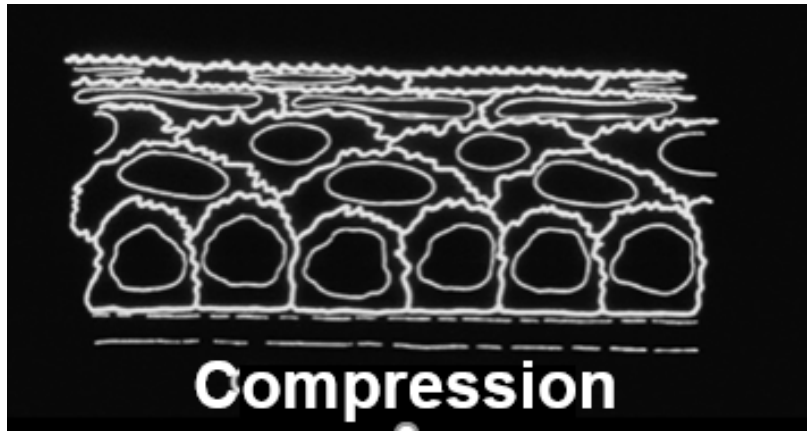
Approximate Total Thickness
540 Microns (.54 mm)

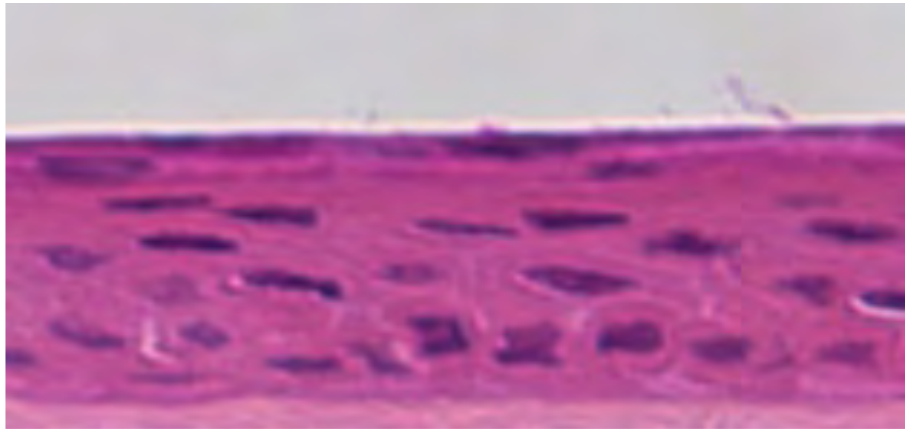


Compression versus Redistribution



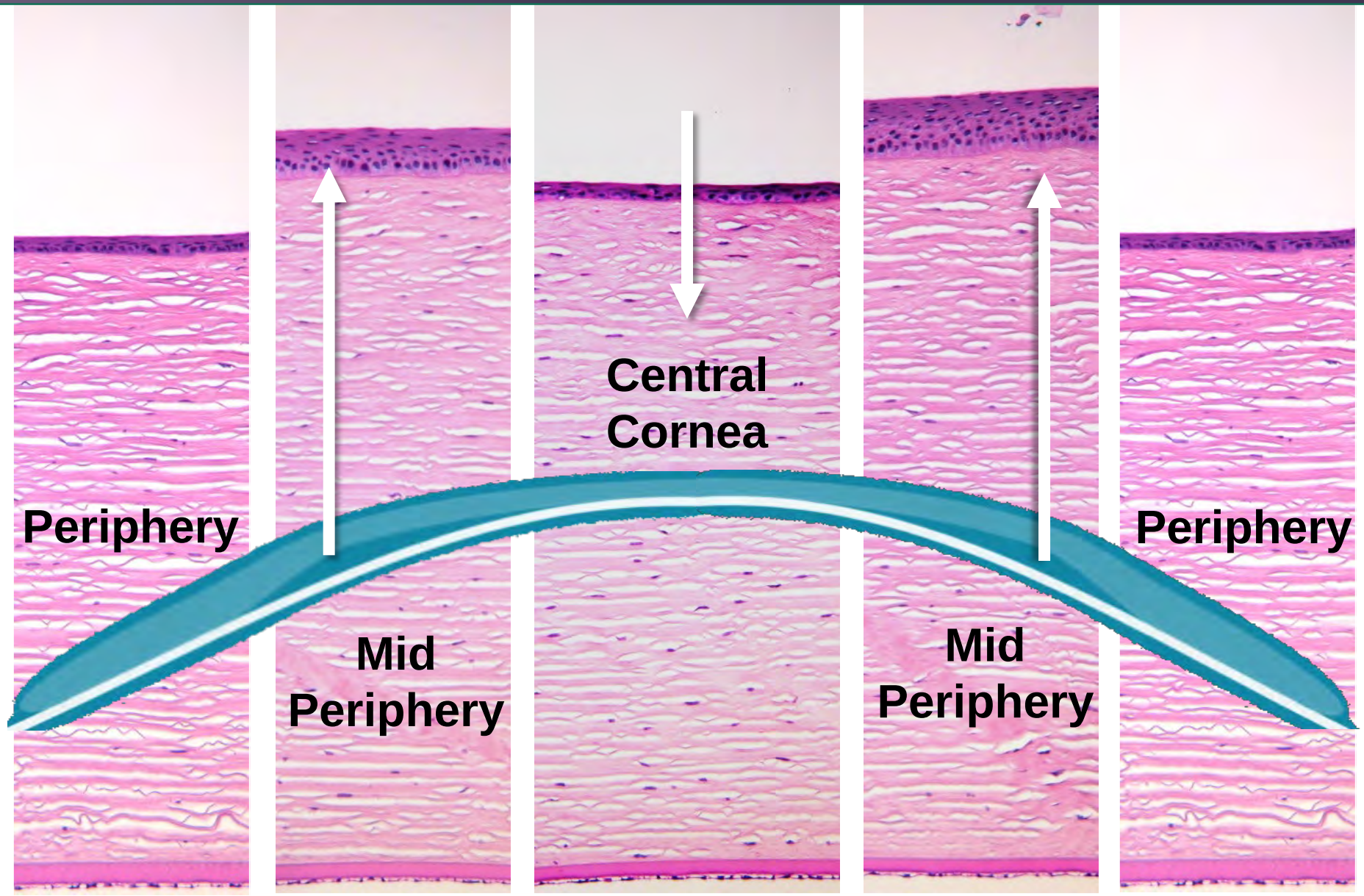






Images courtesy of Pat Caroline

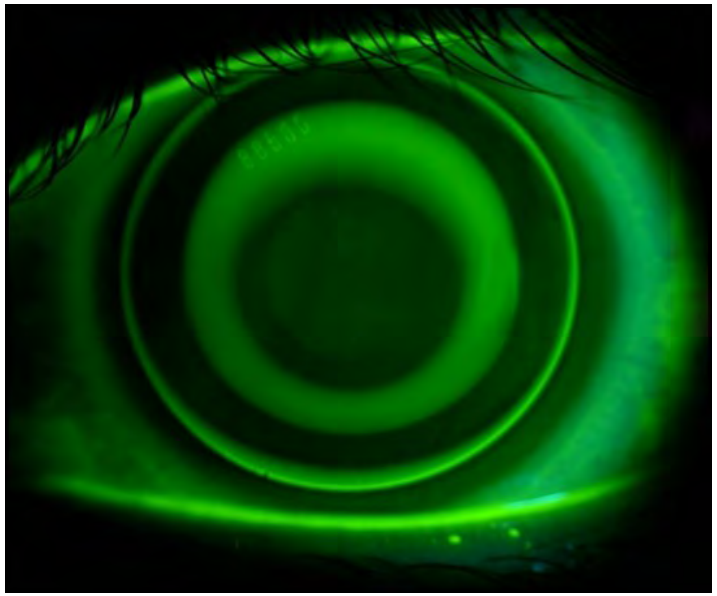
Redistribution of Cellular Fluid

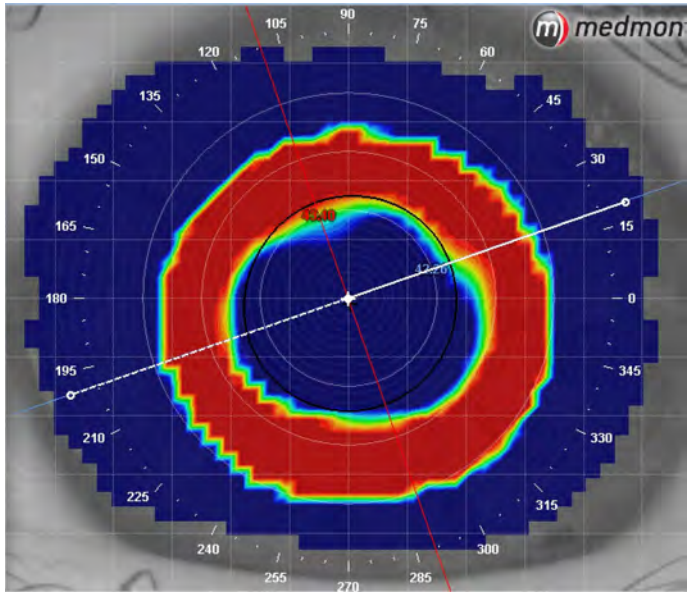


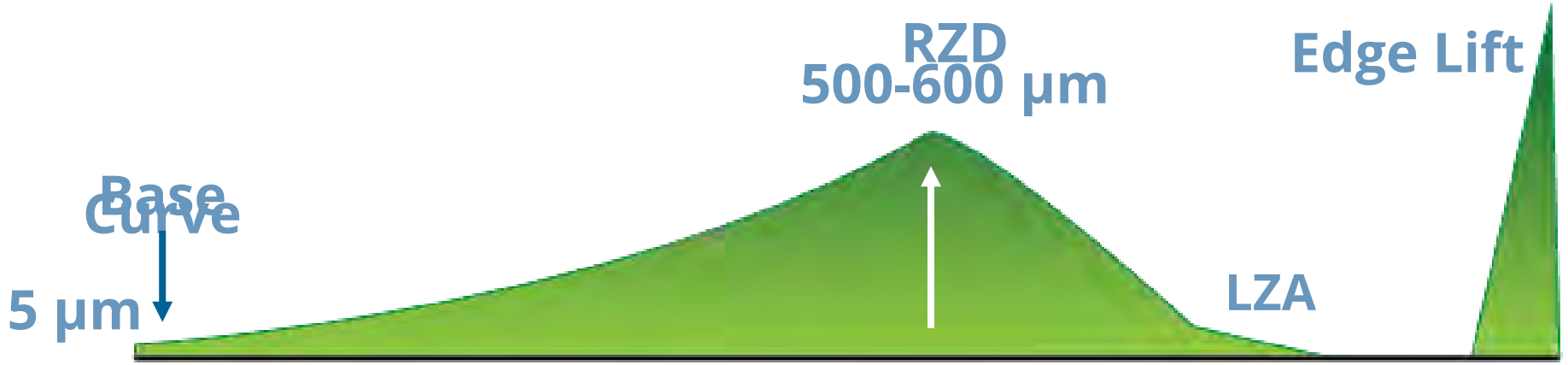
Images courtesy of Pat Caroline

How Does OrthoK work?

Forces work together in a semi-closed environment to allow for appropriate epithelial changes





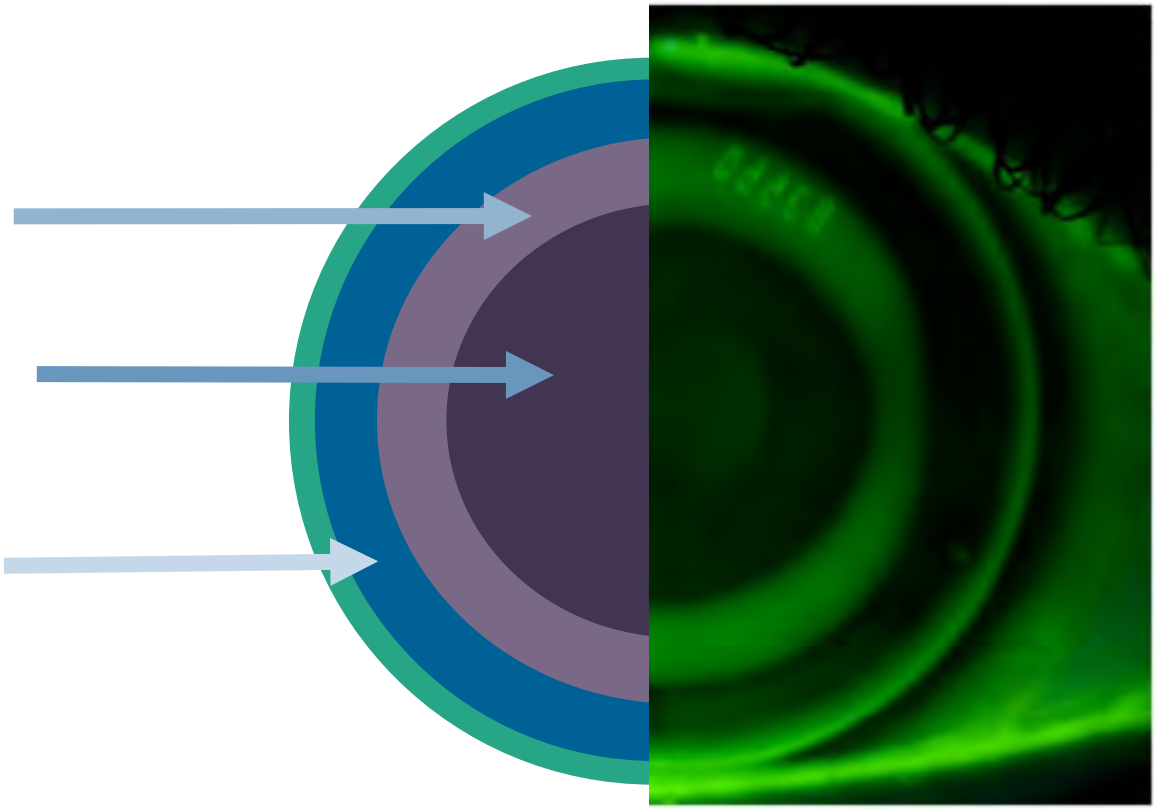


Paragon CRT®

RETURN ZONE 1MM (FIXED)

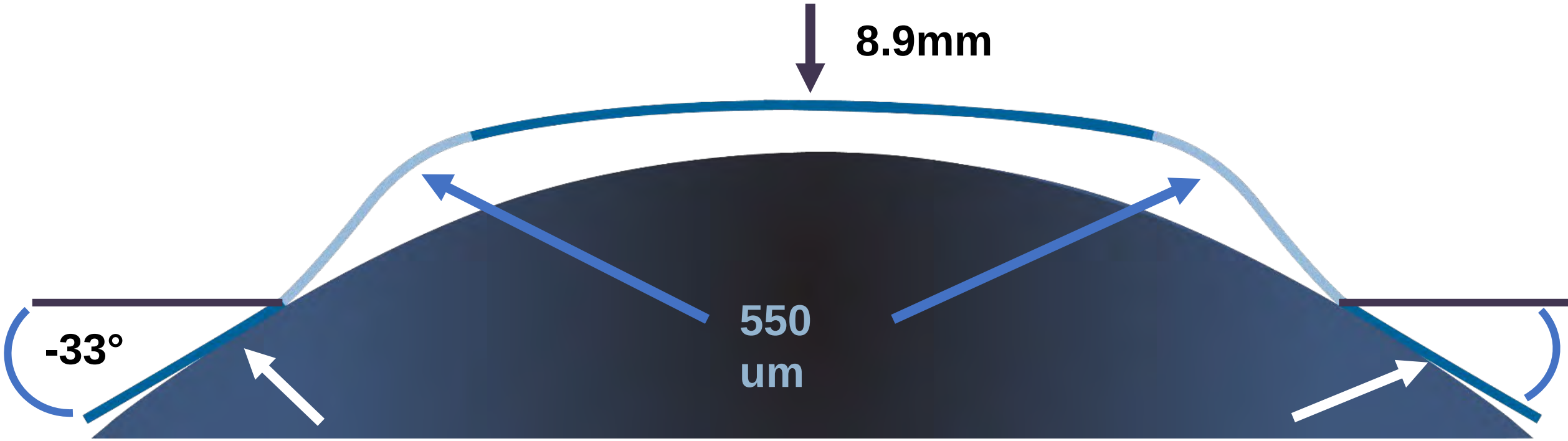
OPTIC ZONE 6 MM (FIXED)

LANDING ZONE (NOT FIXED)
BASED ON DIAMETER SIZE



Paragon CRT®

1. Base Curve (BC) – millimeters (ex: 8.9mm)
2. Return Zone Depth (RZD) - sagittal depth, microns (ex: 550um)
3. Landing Zone Angle (LZA) – degrees (ex: -33˚)



Base Curve (Treatment Curve) Selection

- Provides the mold for the treatment
- Measured in mm of radius (ex: 8.9mm)

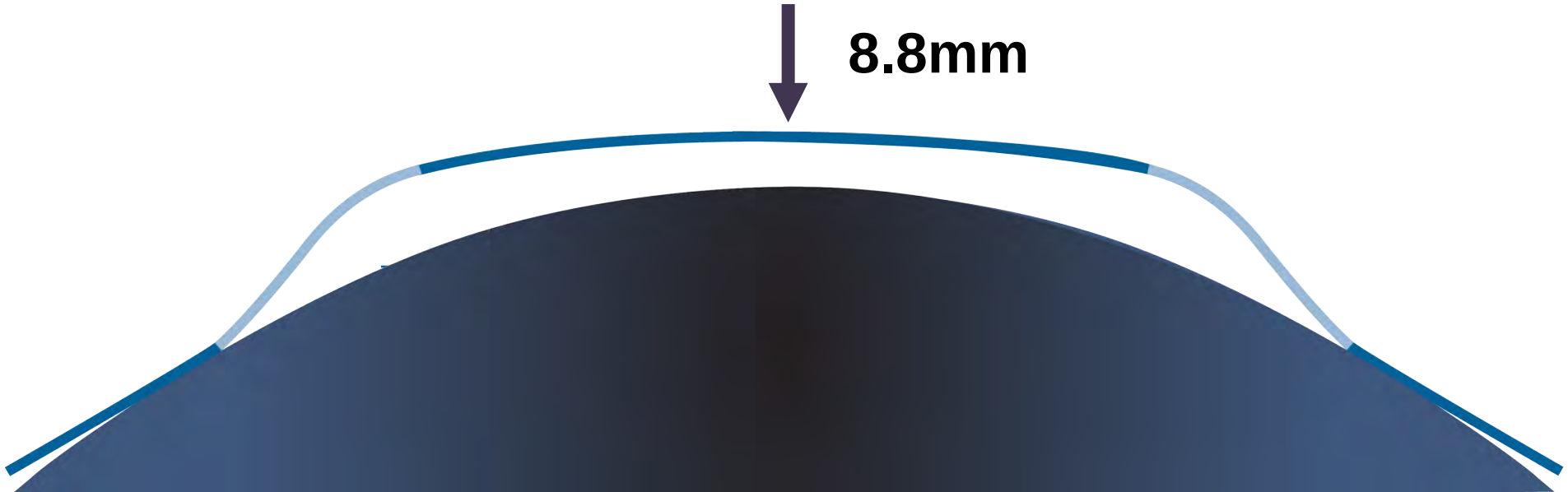
- Calculated from the Initial Lens Selector (slide rule or electronic format)
- Jessen Factor set at +0.50 in all lenses for regression

Calculating BC Selection

- Jessen Factor set at +0.50D in all lenses for regression, fit 0.50D flatter than K

- Patient Manifest Rx: -3.00 Target Rx: -3.00-0.50 = -3.50
- Patient K Values: 42.00/42.40

BC Selection: 42.00 - 3.50= 38.5 (8.76 → **8.8**)



Base Curve (Treatment Curve) Selection

- The Base Curve is *never* adjusted to change the fit.
- When to change the Base Curve?

- CHECK REFRACTION OVER LENS (ROL) to ensure BC is accurate
- Typically, ROL should be plano to +0.50

- The corneal shape does not fully conform to the back surface of the lens
- Young adults, +0.50 to +1.00
- Pre-presbyopes, plano

Return Zone Depth (RZD)

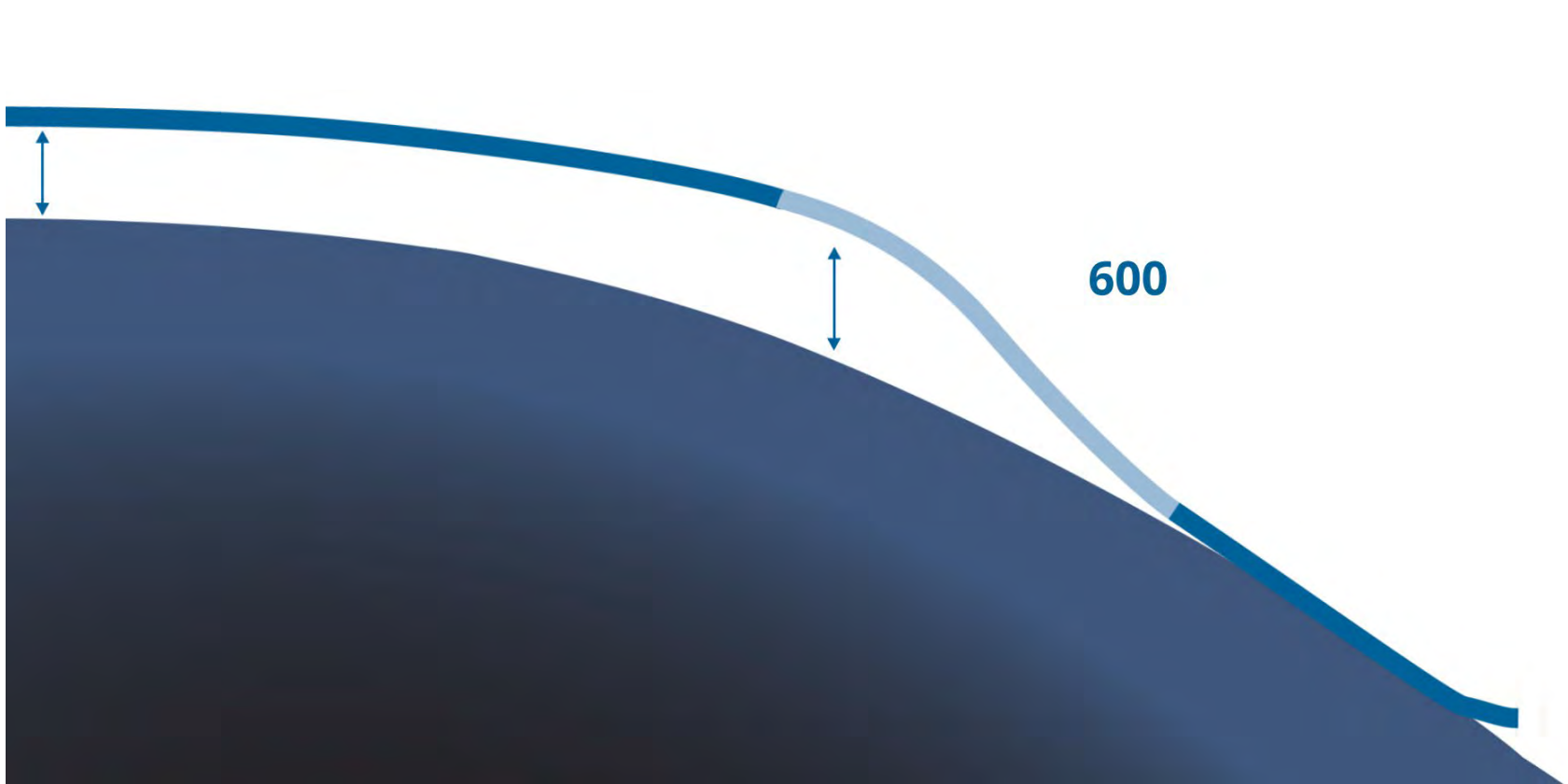
PARAGON VISION SCIENCES

Measured in Sagittal depth (um)
25um increments

DEEPER

600 um
575 um
550 um
525 um
500 um

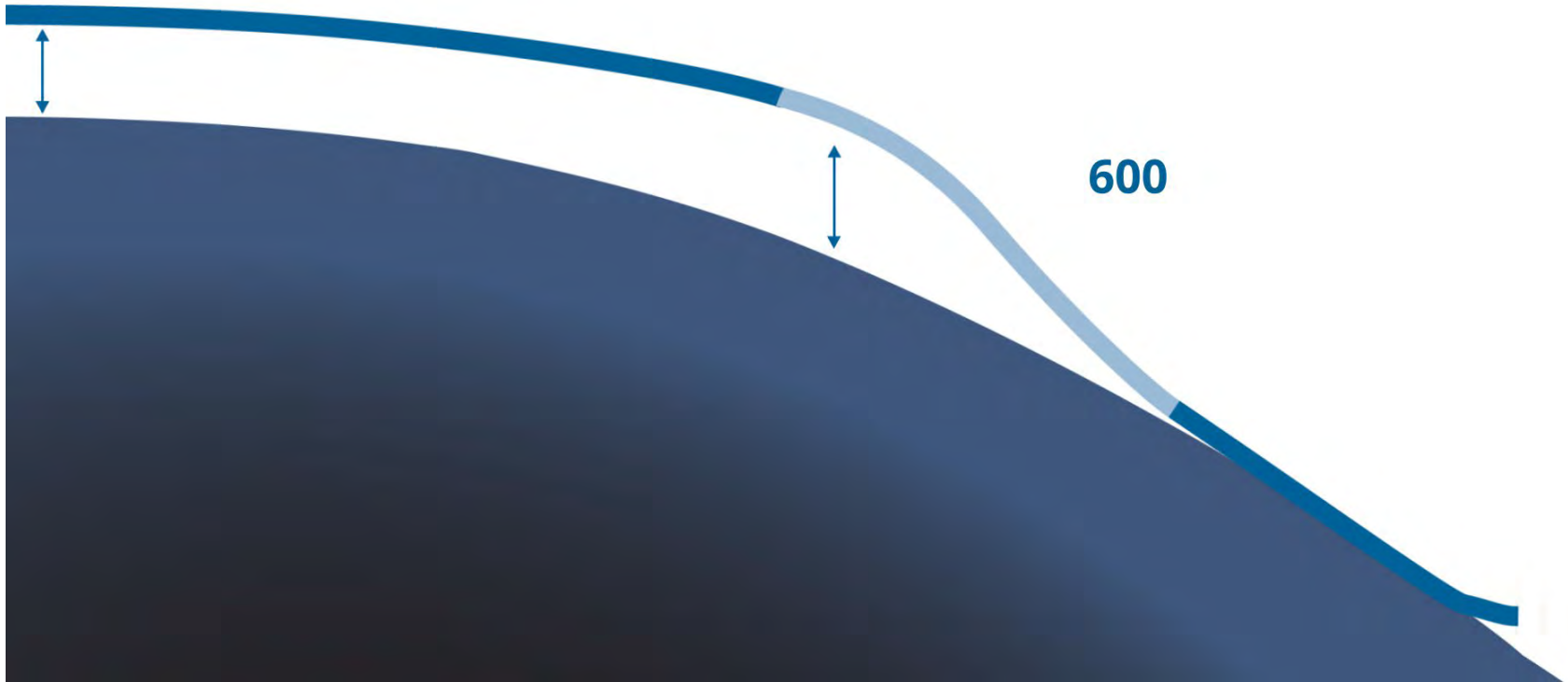
SHALLOWER



Return Zone Depth (RZD)

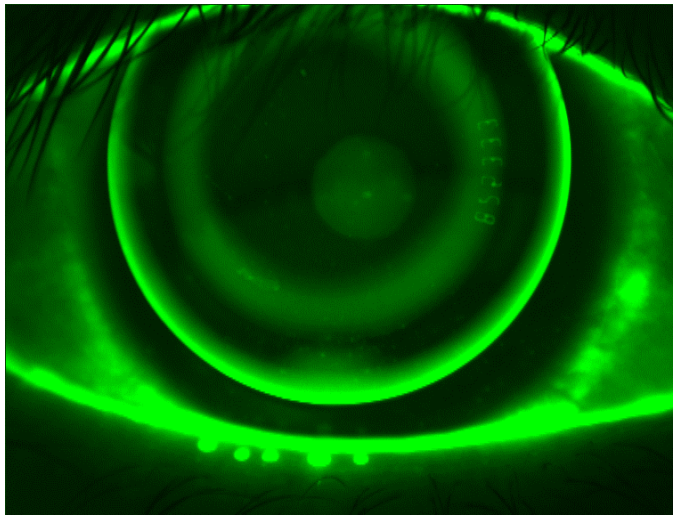
When to change Return Zone Depth?

Centration!

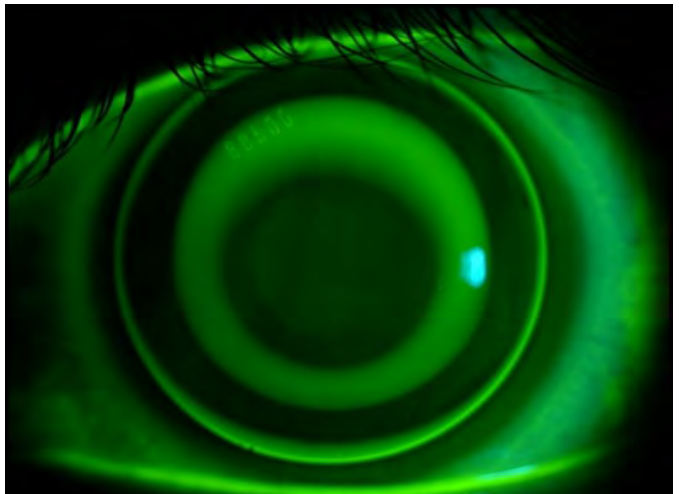


Return Zone Depth (RZD) – Too Flat

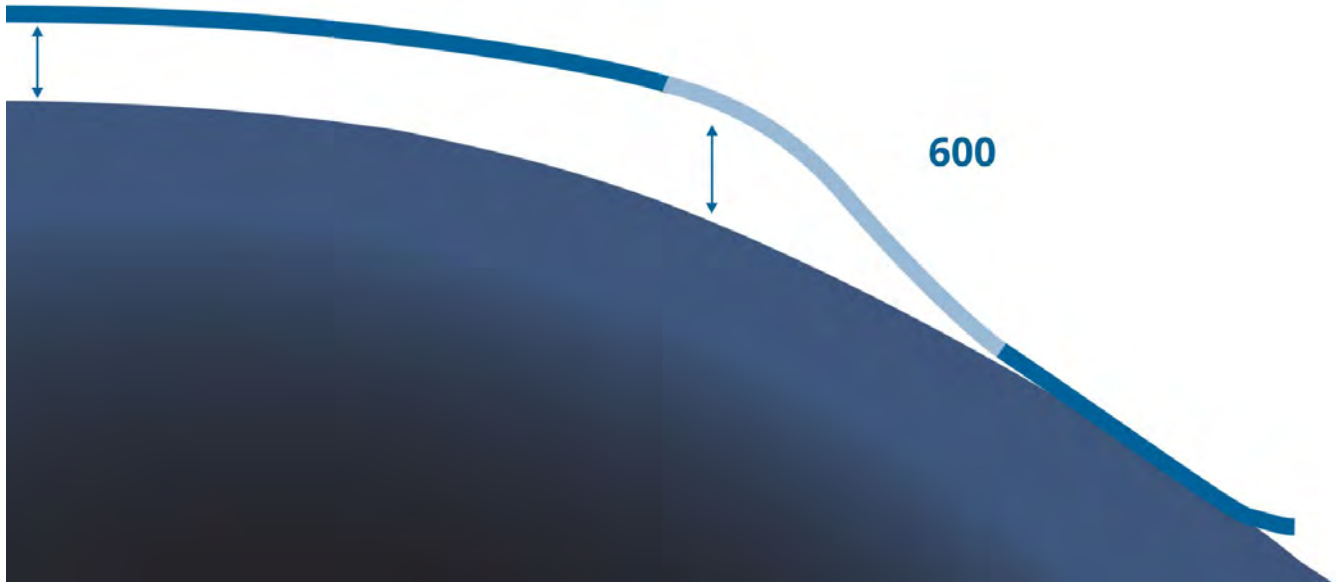
Sagittal Depth Changes (changes in 25um steps)



500 RZD



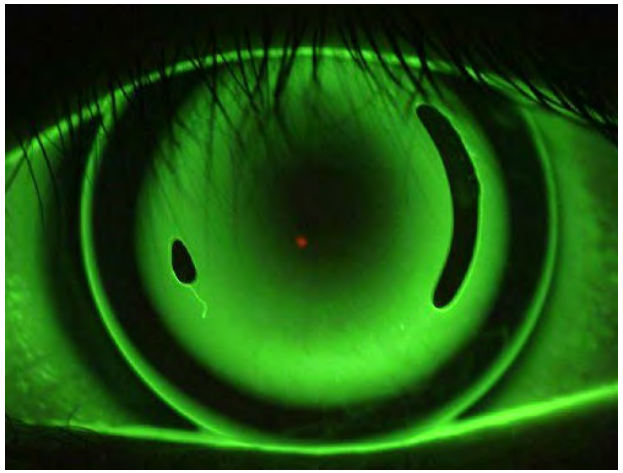
525 RZD



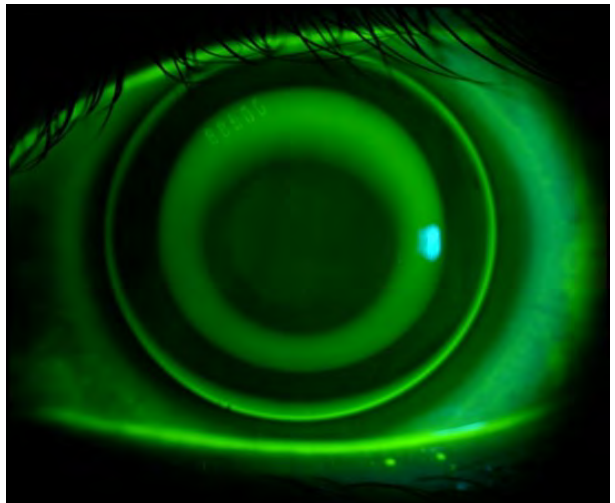
Precise Control of Applied Treatment through Proximity Control Technology™

Return Zone Depth (RZD) – Too High

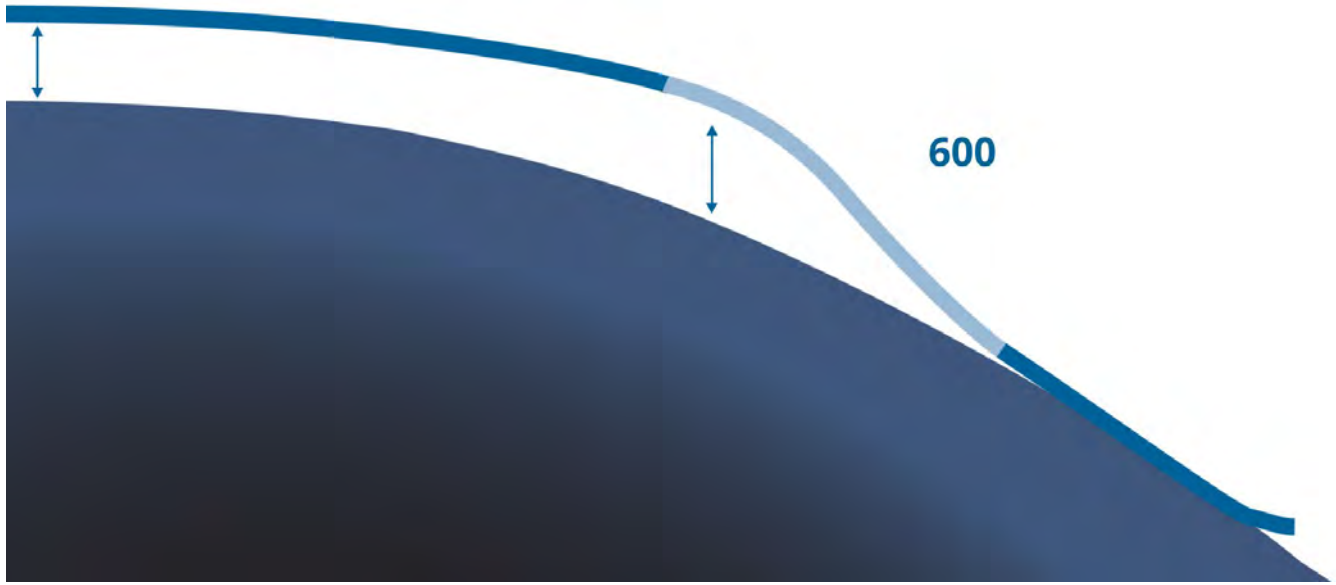
Sagittal Depth Changes (changes in 25um steps)



600 RZD

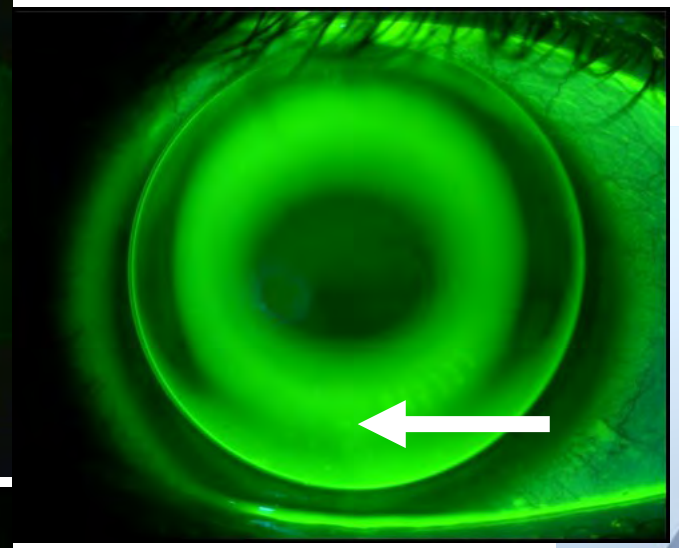


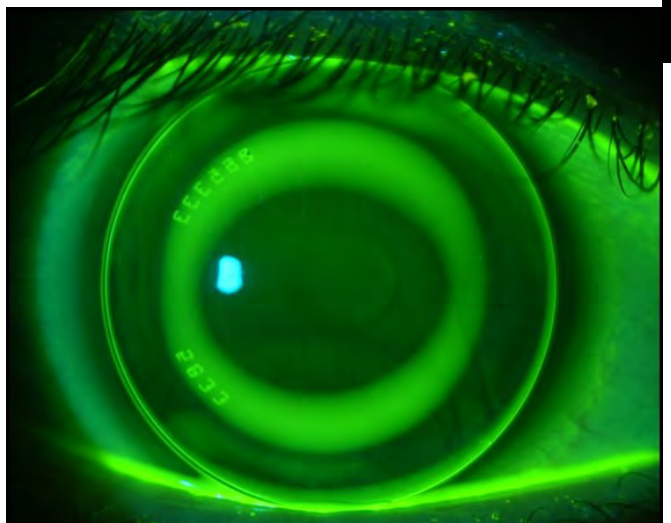
550 RZD



Precise Control of Applied Treatment through Proximity Control Technology™

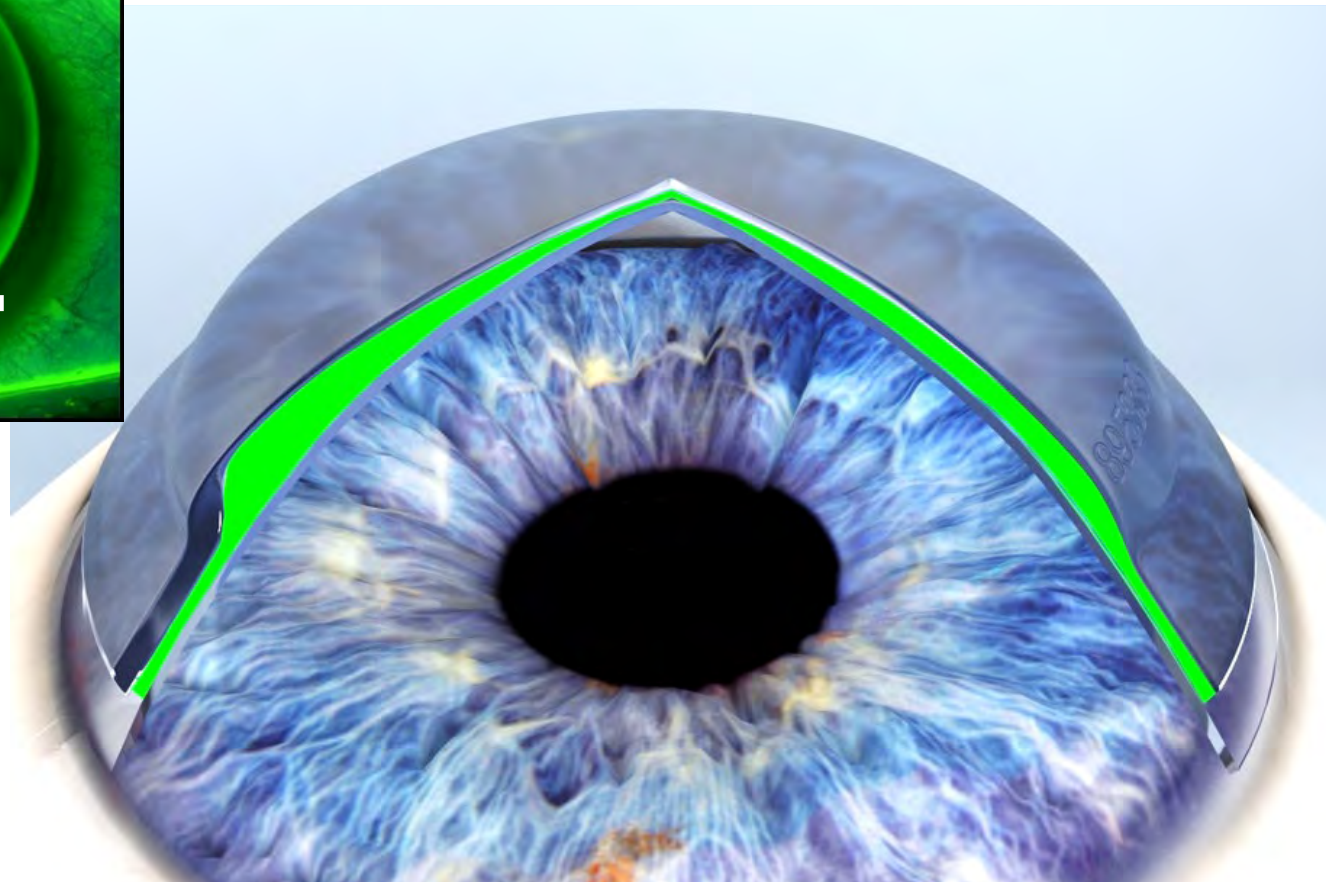
Return Zone Depth (RZD)



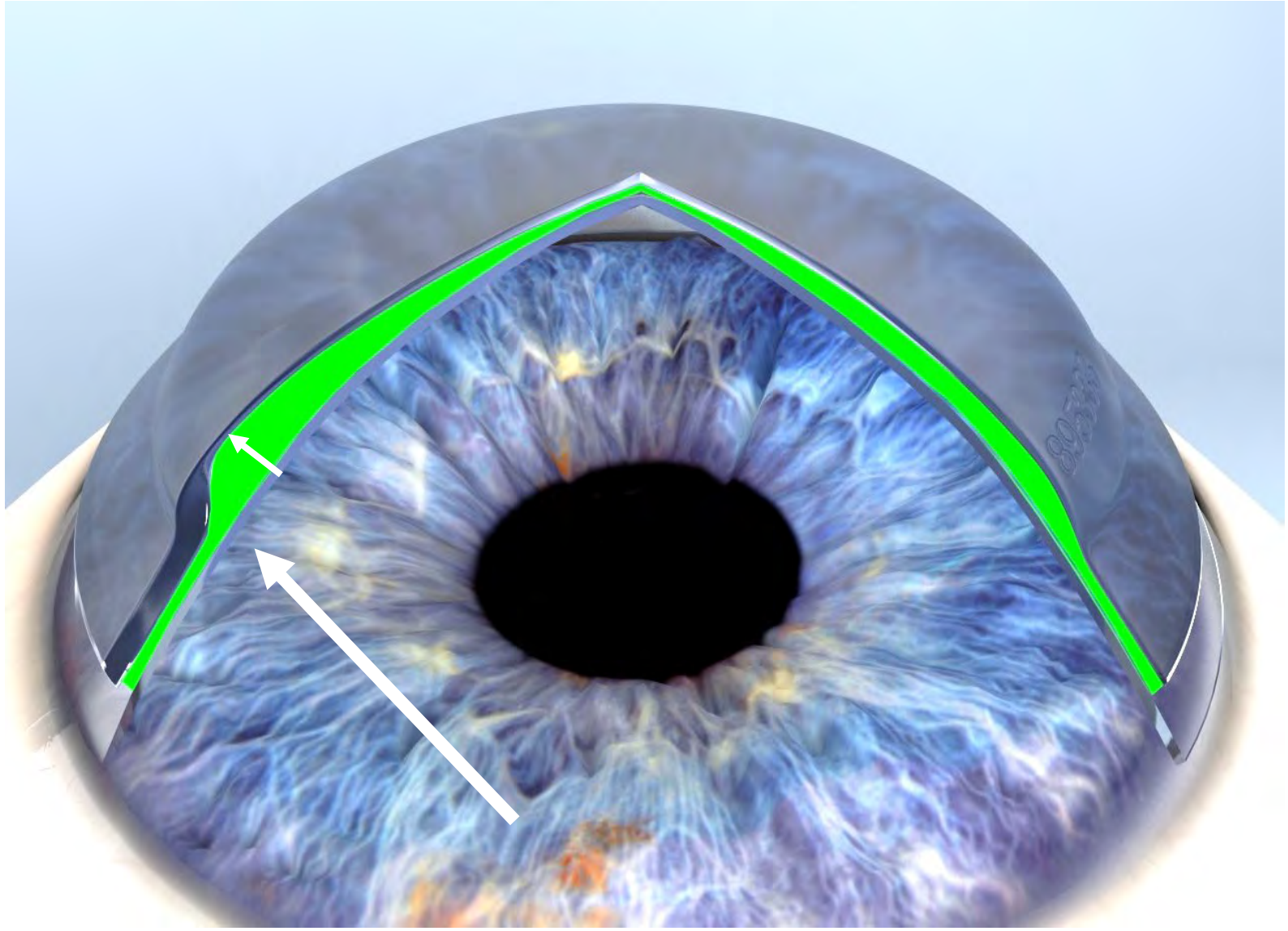


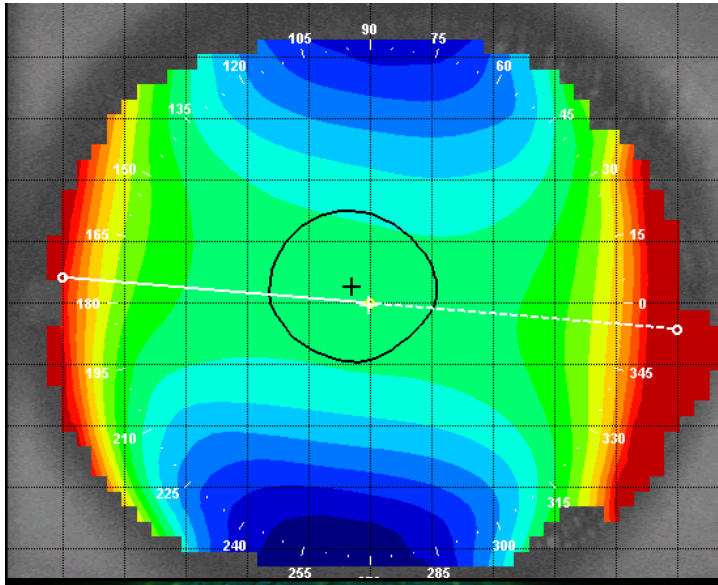
Spherical CRT on eye with corneal cylinder and enough elevation difference = incomplete peripheral alignment

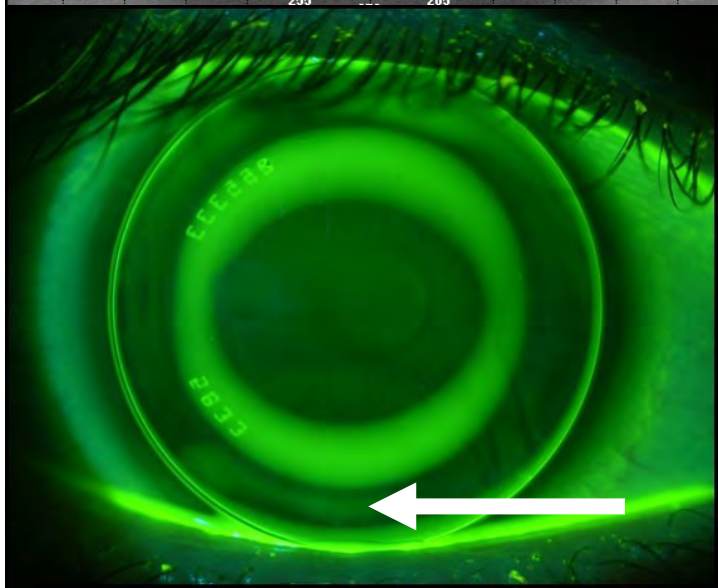
550/600
RZD1/
RZD2



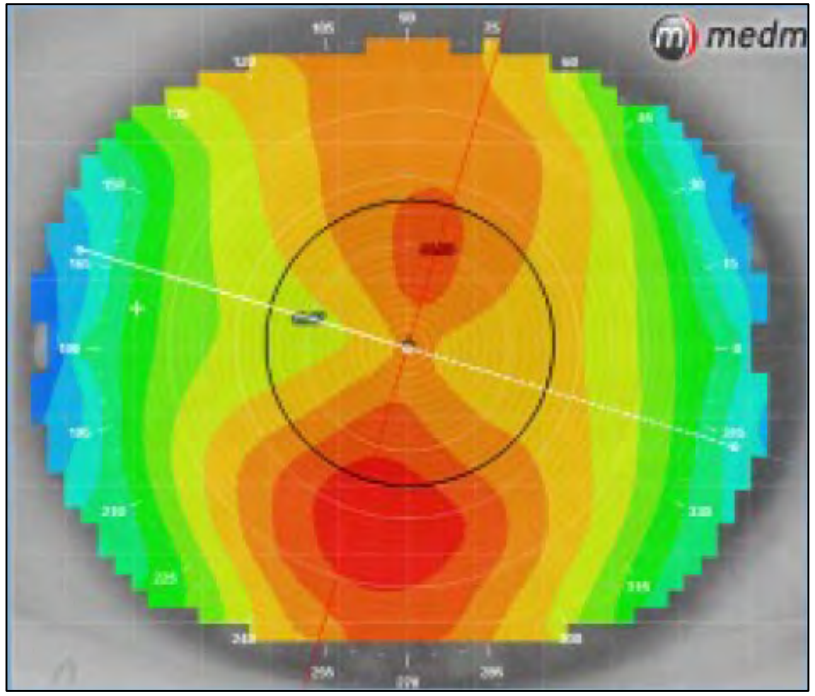
Paragon CRT Dual Axis Design





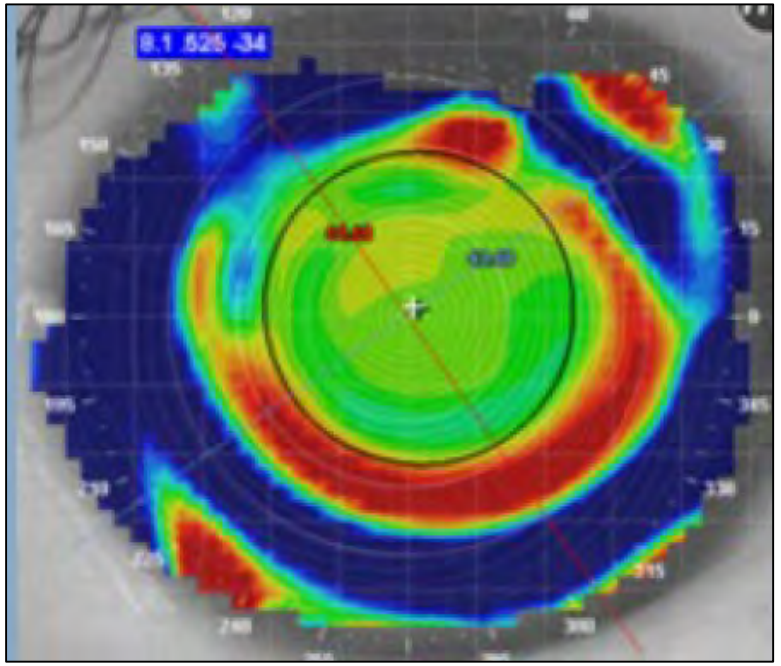


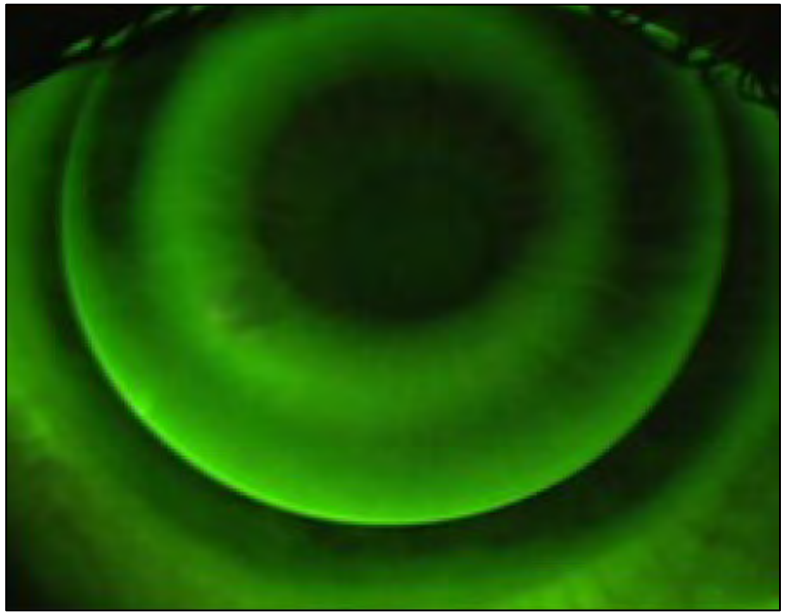
Dual Axis Candidates



Corneal Toricity
≥ 0.75D

Incomplete Treatment or
“Bull’s Eye” Pattern





Stubborn Decentered
CRT Lens

Using Corneal Cylinder to help determine initial Dual Axis depth difference

PARAGON VISION SCIENCES

Fitting Guide

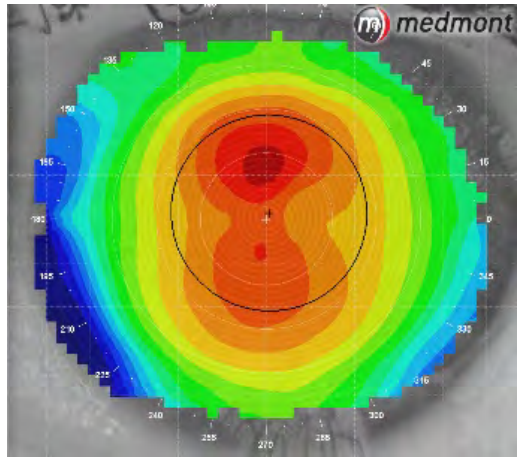
*just a guide to start - may still need to adjust/increase RZD difference based on NaFl pattern of lens and topography

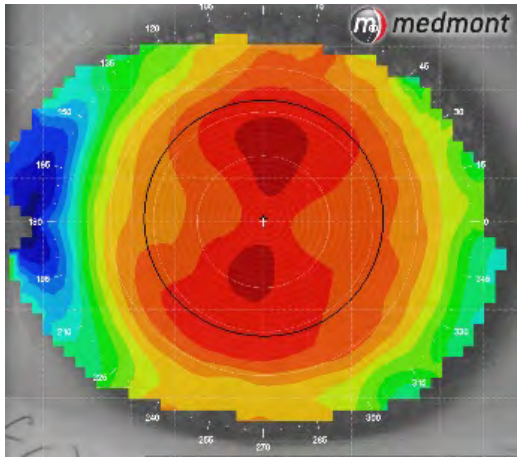
0.75D – 1.50D of cyl ~ 50µm RZD1/2

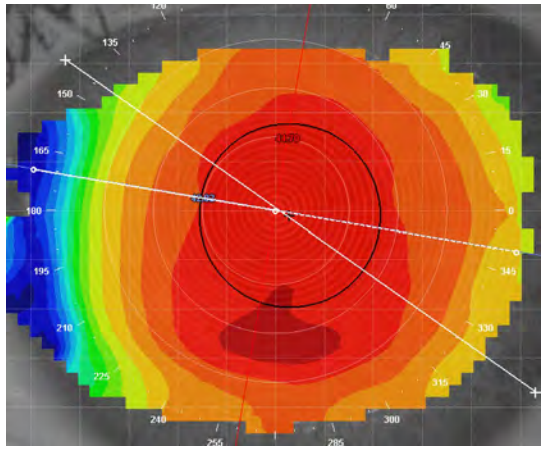
1.50D – 1.75D of cyl ~ 75um RZD1/2

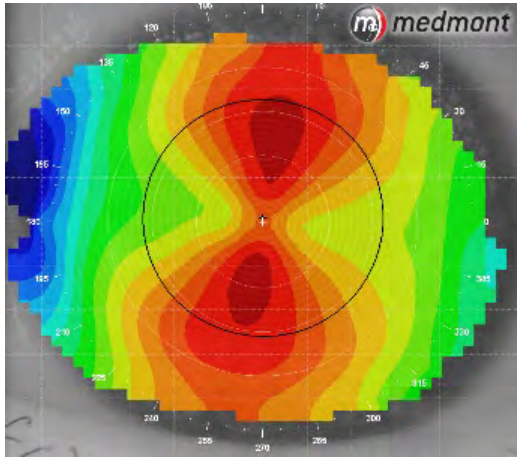
Customize RZD_1/RZD_2 in 25 µm steps,

Lens has been made up to 175 µm difference in dual depth



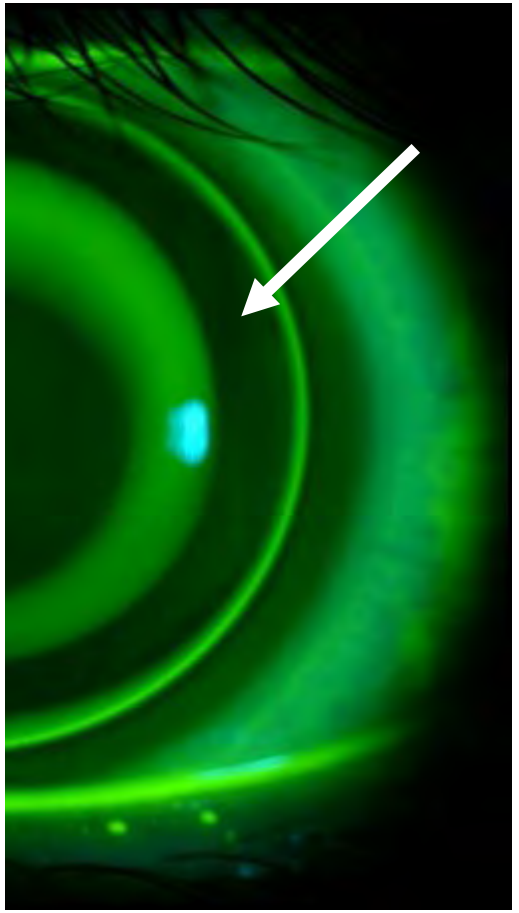






“Safe” Landing Zone Angle (LZA)

Landing Zone can *only* be tangent to the underlying corneal surface



Landing Zone Angle (LZA)

Angle (degrees)
1° increment

Higher degree number (34°)
= Steeper

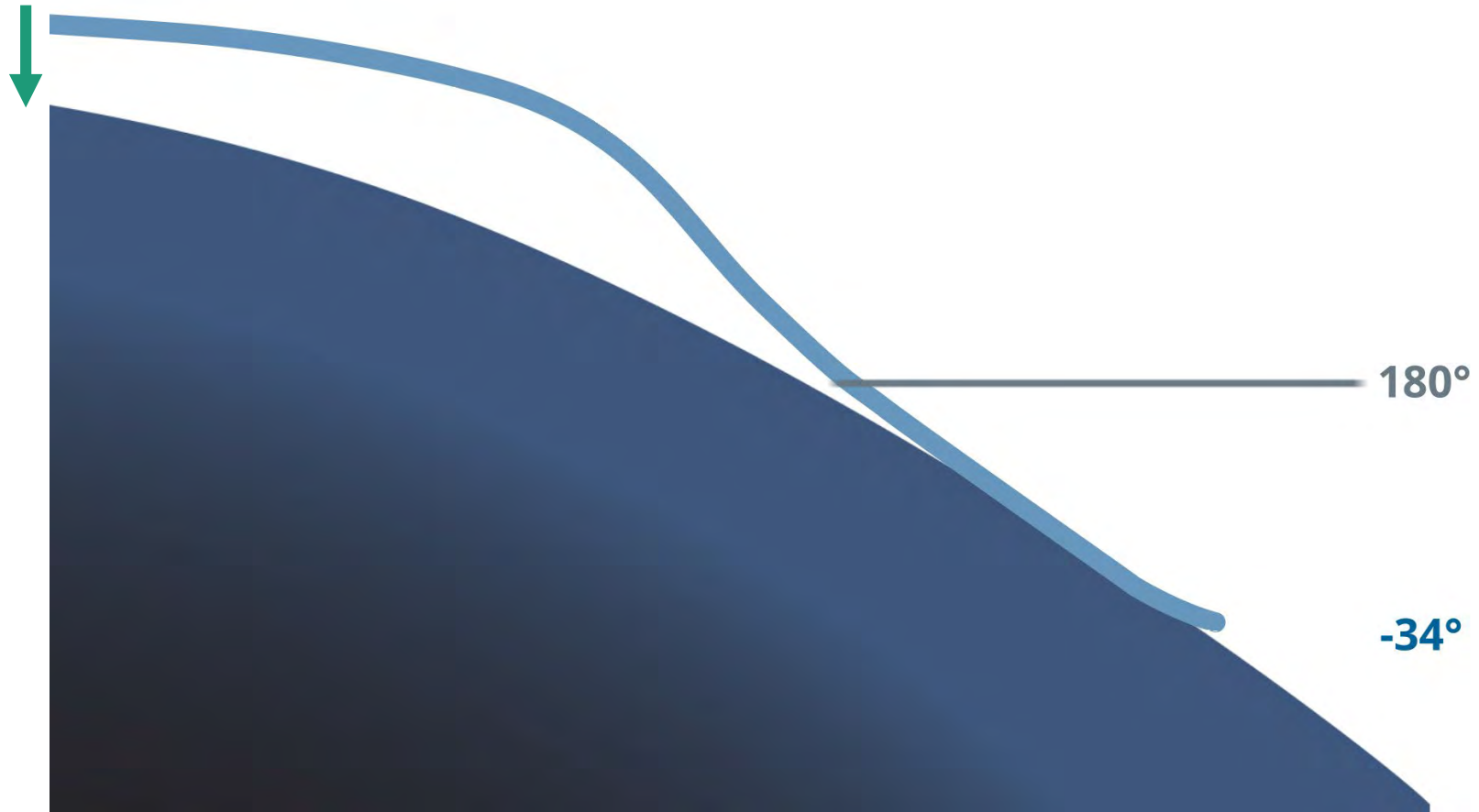
- 1° increase = increase sagittal depth (+15um)

Lower degree number (31°)
= Flatter

- 1° decrease = decrease sagittal depth (-15um)

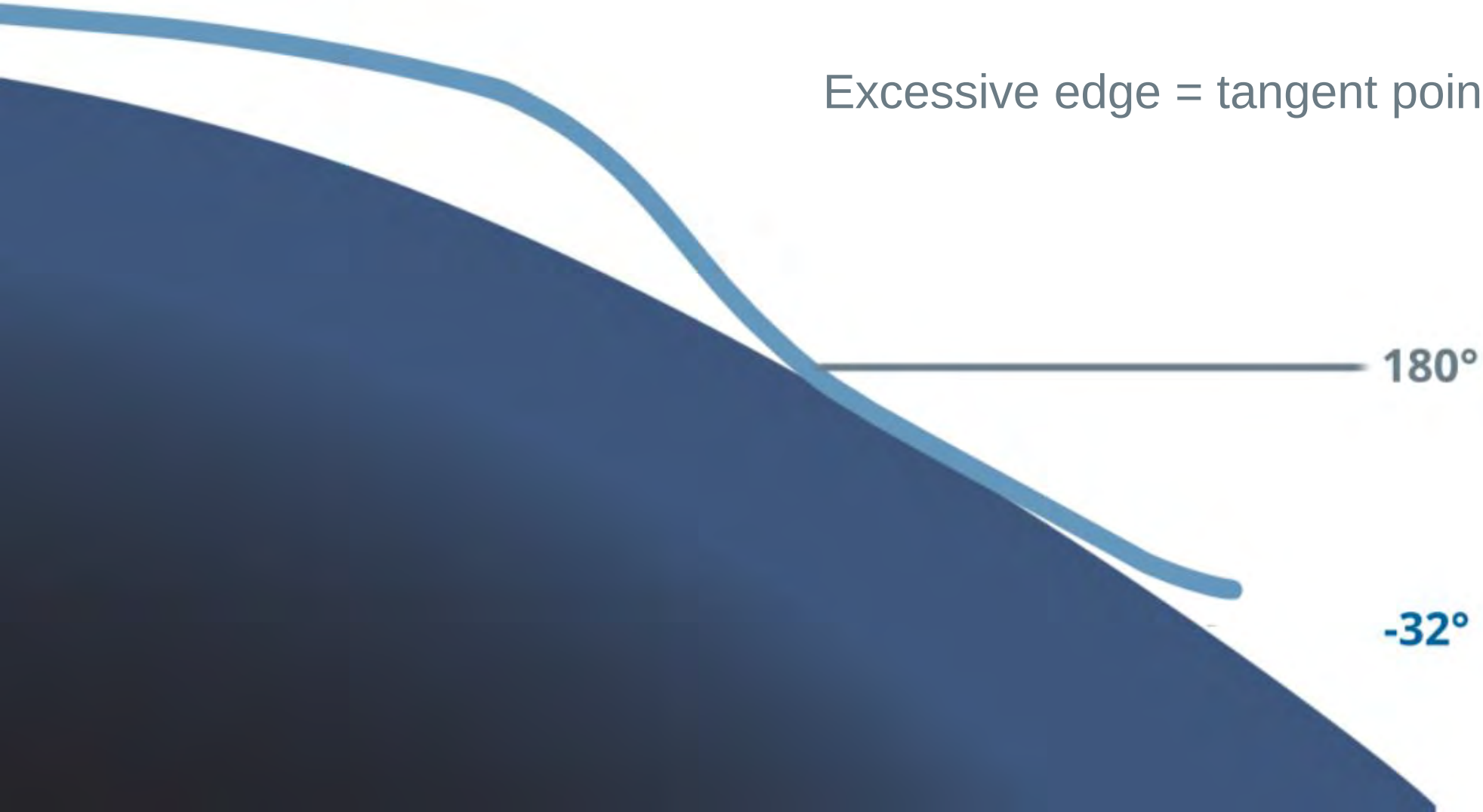
Controls:

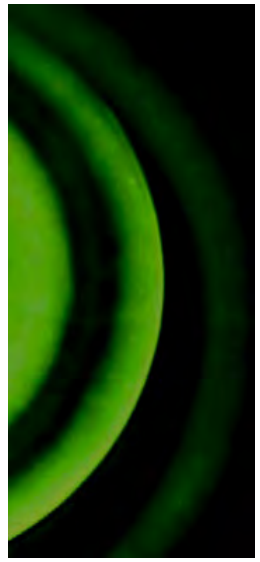
- Edge lift
- Overall sagittal depth

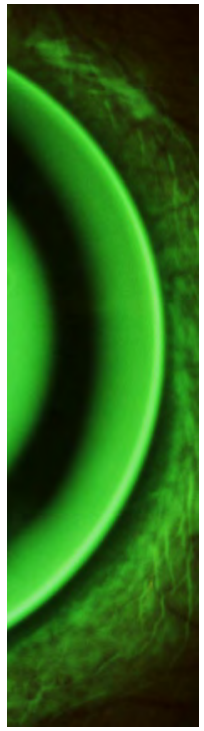


Landing Zone Angle (Too flat)

Excessive edge = tangent point too far

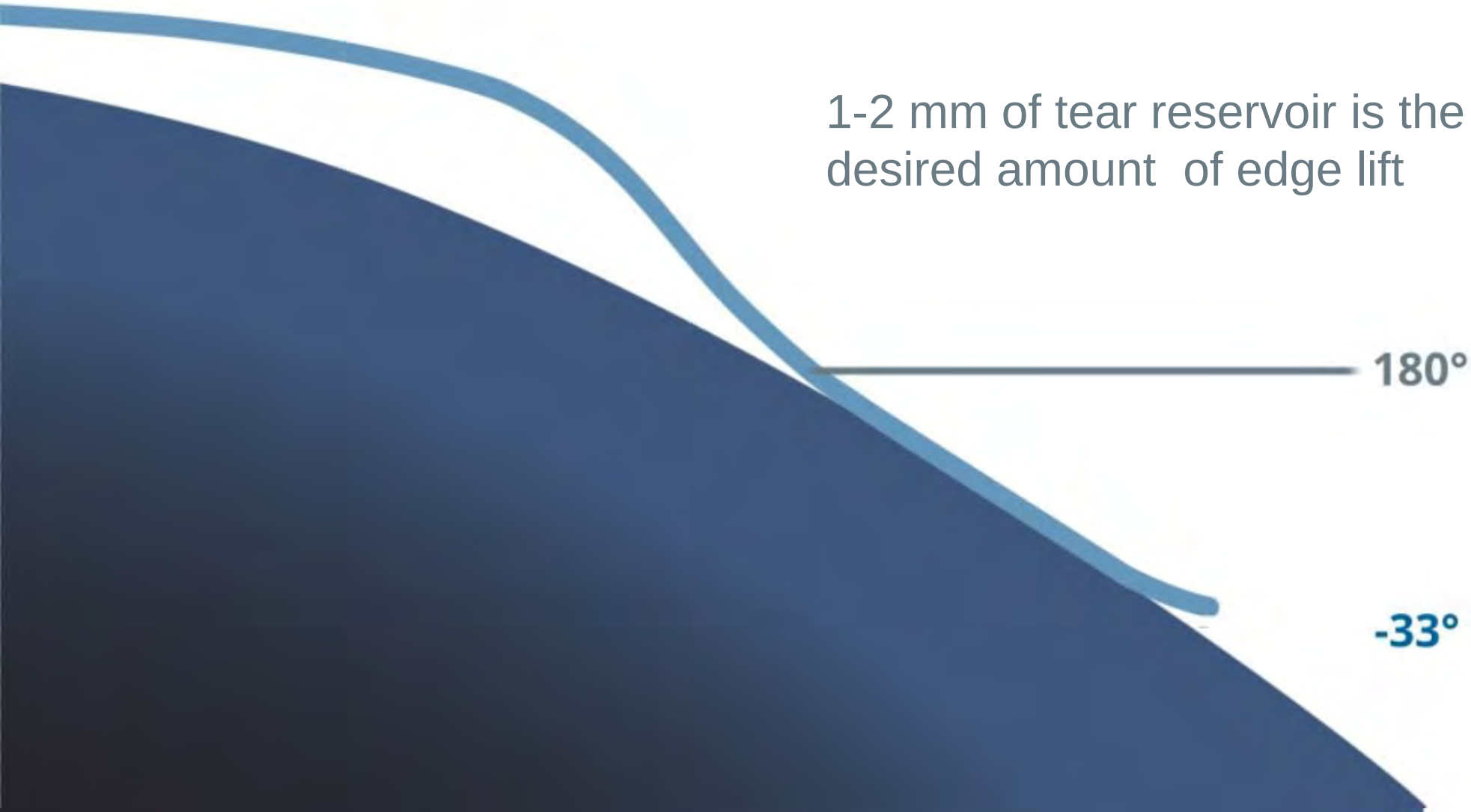


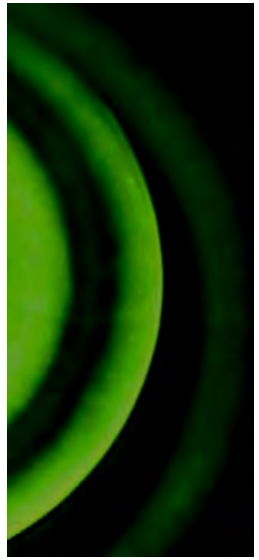


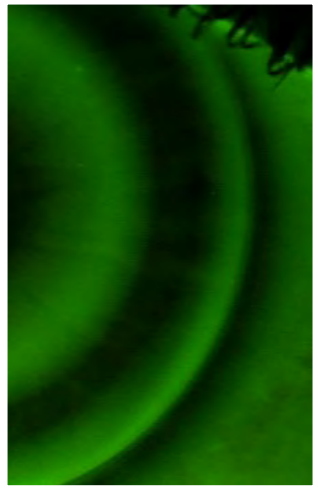


Landing Zone Angle -32 ° → 33°

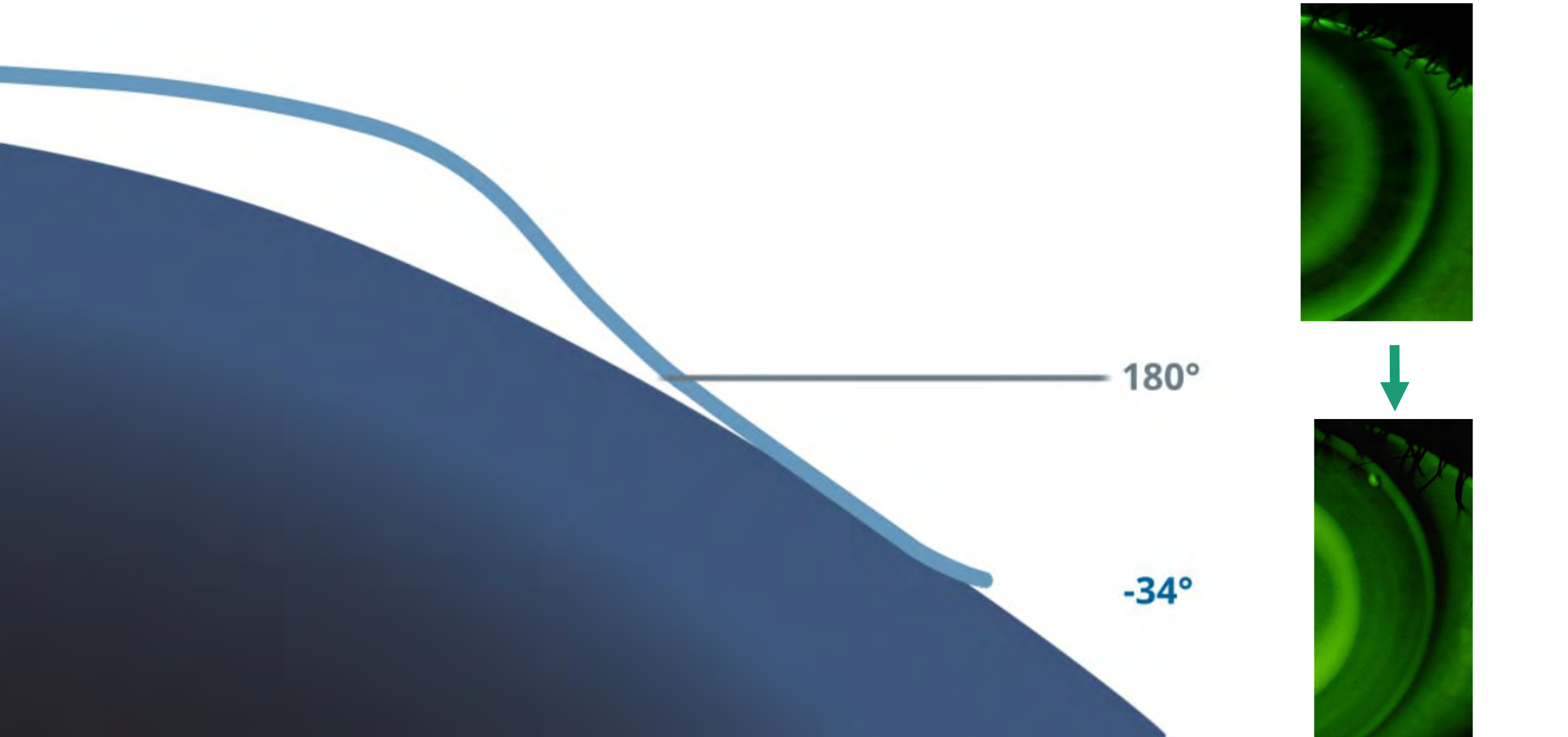
1-2 mm of tear reservoir is the desired amount of edge lift







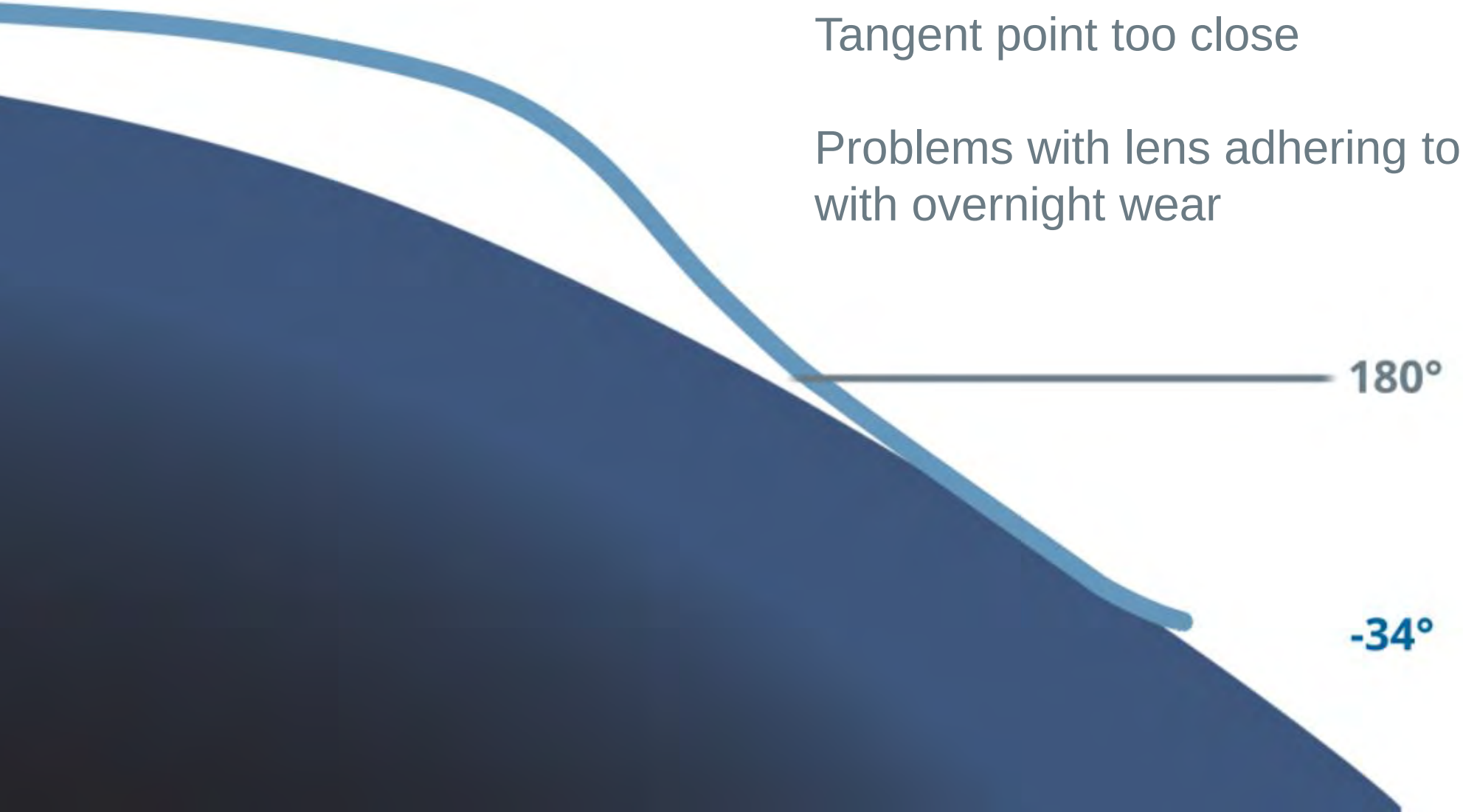
Landing Zone Angle -33° → -34°

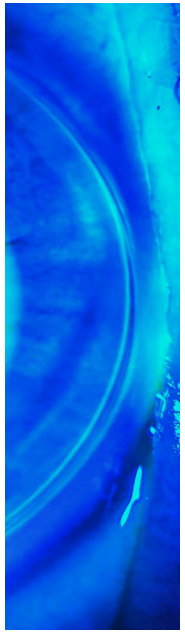


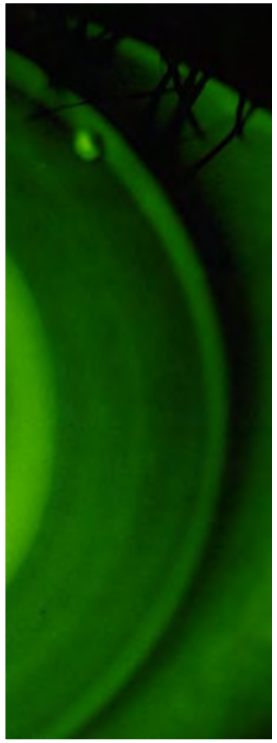
Landing Zone Angle (Too Steep)

Tangent point too close

Problems with lens adhering to eye with overnight wear







CRT Dual Axis

+ Proximity Control Technology – CRT is the ONLY lens able to change lens parameters independently of each other

+ Allows for independent manipulation of a second RZD and LZA (if needed) to mimic elevation difference

- RZD1 (500um) and RZD2 (550um)
- LZA1 (32°) and LZA2 (33°)

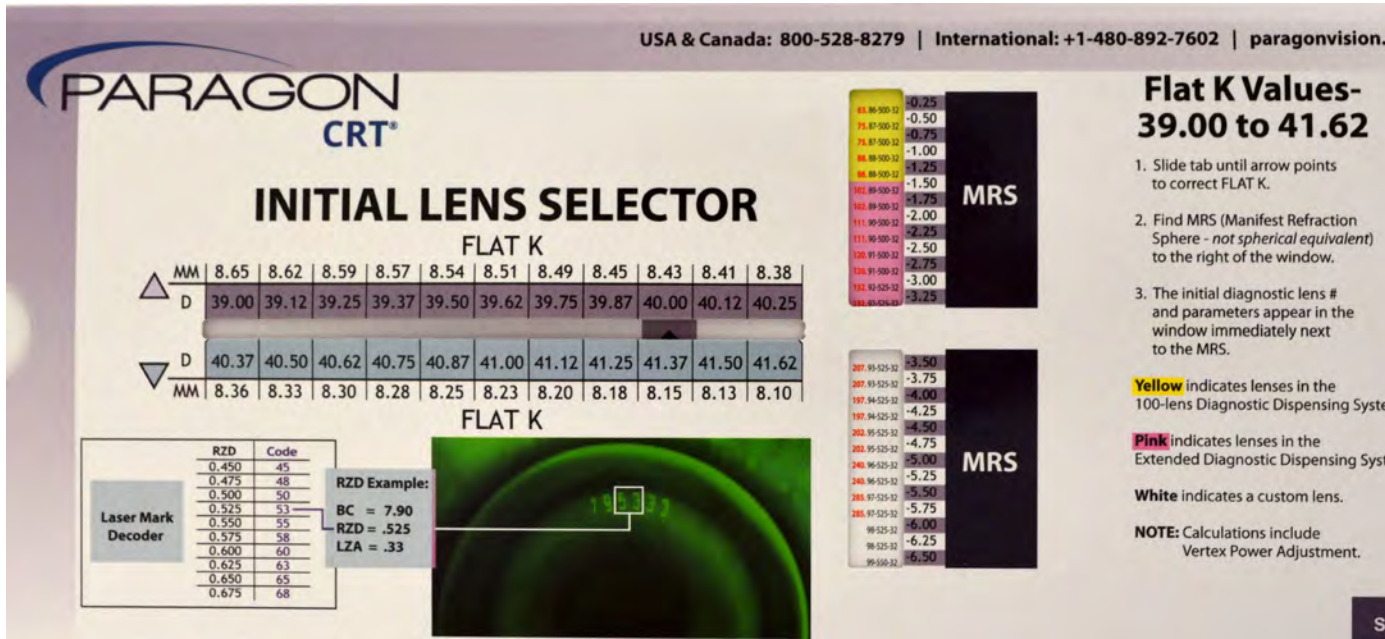
+ Base curve remains the same

Questions?
PARAGON
VISION SCIENCES

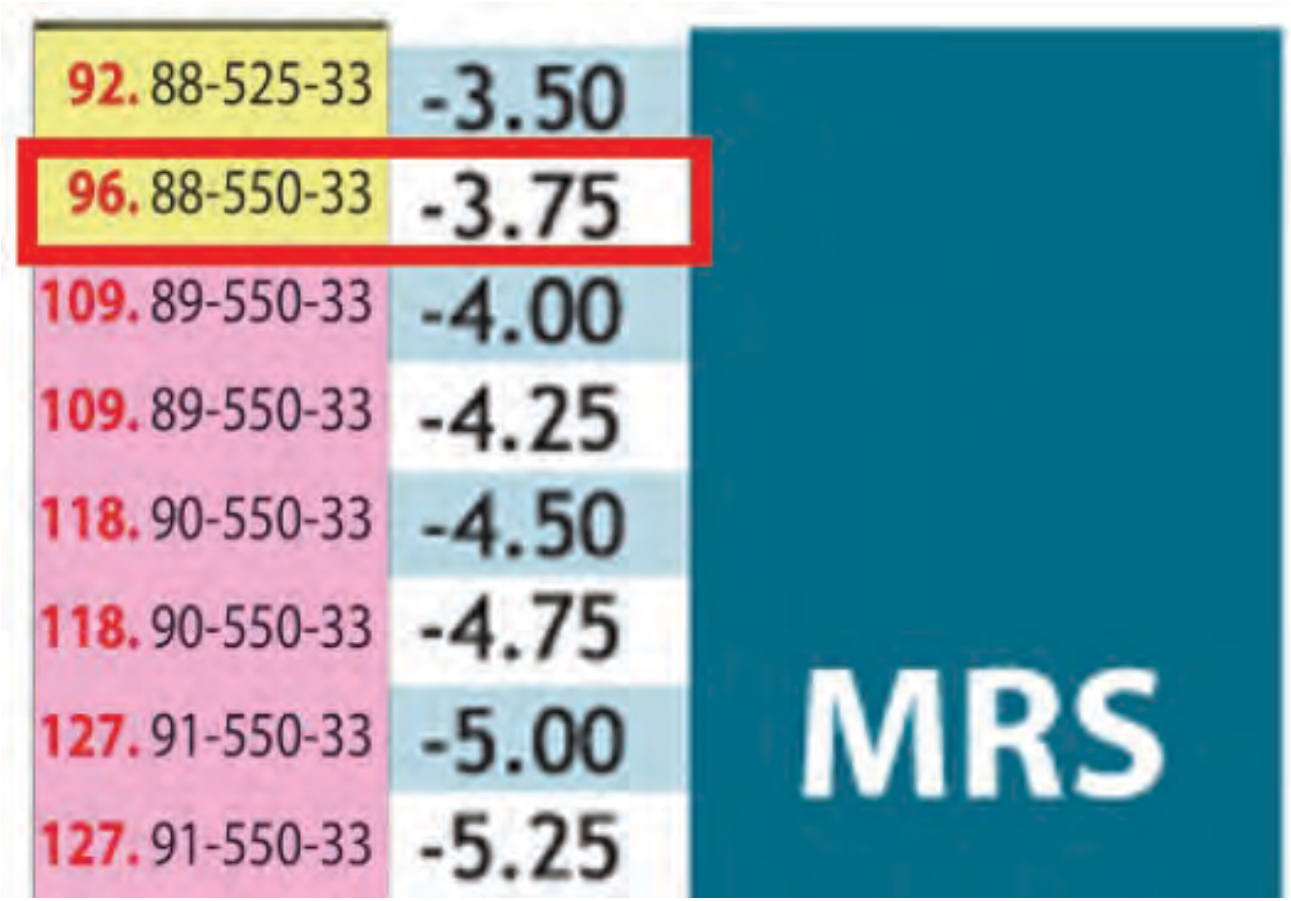
Calculate Initial Lens Parameters

Flat K /Steep K	Manifest Refraction Sphere	Corneal Diameter Size
42.00/43.00	**-2.50** -0.50 x 180	11.6mm

1) Slide tab until arrow appears at correct Flat K



Initial Lens Selection – Numbered Ruler



2) Manifest refraction sphere

3) Initial diagnostic lens parameters appear in the window to the left

Lens #96

Parameters: 88-550-33

BC = 8.8mm

RZD = 550um

LZA = 33 degrees

Initial Lens Selector

	Flat K	Steep K	MR Sphere	CRT	lens #
OD	42.00	42.50	3.25	88-525-32	91
OS	42.50	44.00	4.00	89-575-625-33	#N/A

Note: ↑
Do not insert a minus symbol (-) for Manifest Refraction Sphere.
All calculations include Vertex Power Adjustment

PARAGON
VISION SCIENCES
*We don't just change vision, **we change lives.***

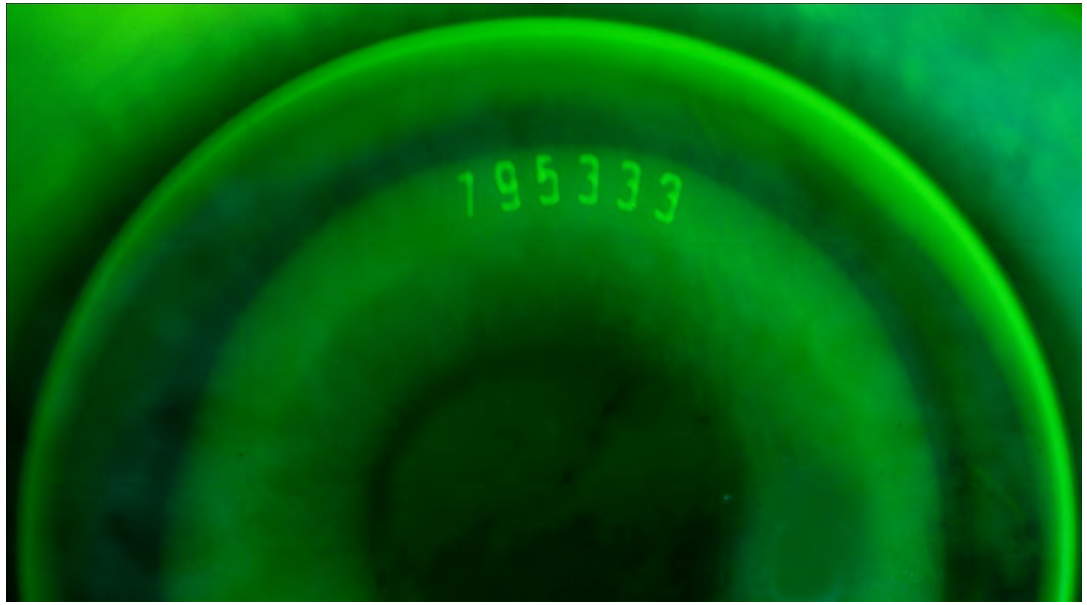
Initial Lens Selector (Electronic Version)

Customization of Lens

G indicates green tint

Tint: Green, Blue, Red, Yellow, Clear

Lens Identification



ALL lenses are laser marked in the RZD to identify exact parameters

BC= 7.9
RZD = 525 (53), 575 (58), 625 (63)
LZA = 33

It’s as Easy as 1,2,3

1 - Determine Initial Diagnostic Lens

2 – Centration

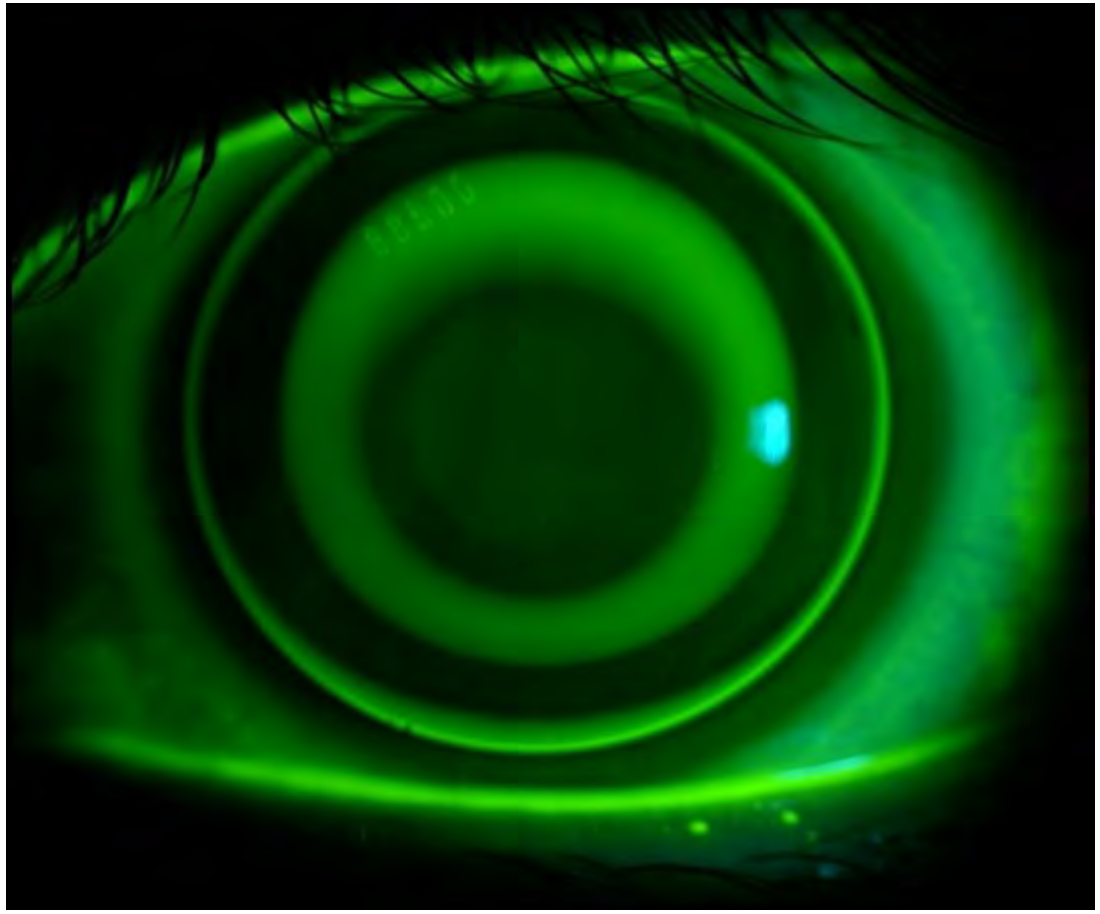
Appropriate Treatment Zone (3-4mm)

Moderate tear-film touch in the mid-periphery

Adjust Edge Lift, if necessary

Be aware of lid interaction

3 – Check Refraction over lens (ROL) to determine BC/myopia treatment → +0.50



<u>Centration</u> is the key to success

Ordering Paragon CRT Lenses

Empirical Lens Order
Flat K/Steep K (for CRT Dual Axis) Manifest Refraction
Standard Power: +0.50, Can Customize Power • (-2.00 to +2.00)
Corneal Diameter Size, 10.5mm >12.0mm, order 11.0mm, 11.5mm
Material: Paragon HDS 100, Menicon Z Tint: Green, Blue, Red, Yellow

Diagnostic Dispensing System
100/136 CRT Lenses 16/80 CRT Dual Axis • 10/14 different Base Curves • Combination of RZD & LZA
Power: +0.50
Diameter: 10.5mm
Material: Paragon HDS 100 Tint: Green

Questions?
PARAGON
VISION SCIENCES

Missing Lenses in DDS

What if the suggested lens in not the DDS set?

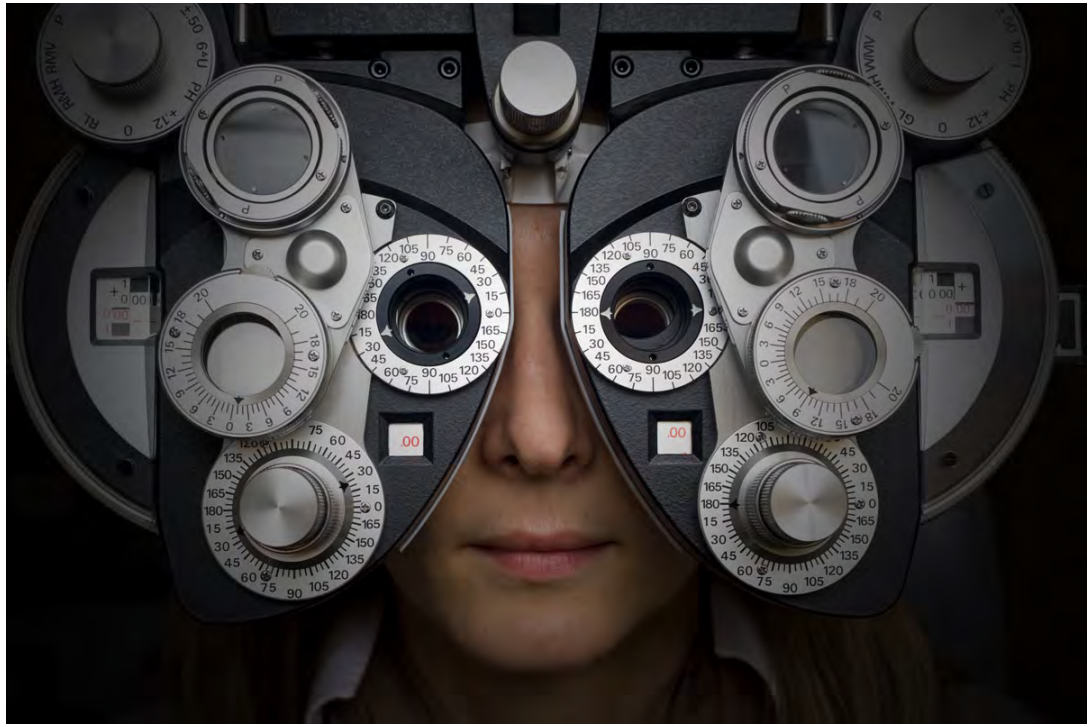
- The lens you need has been previously dispensed = 8.6 550 -33
- **Fit 0.10mm Flatter in Base Curve = 8.7 550 -33**
- BC is the least important parameter for evaluating centration.
- RZD/LZA combination is the most important for centering and tear pattern evaluation.
- ROL will determine which BC is necessary (+0.50D)

Subjective Over-Refraction (OR)

A subjective refraction over the lens (ROL) determines:

- Accuracy of the treatment Base Curve calculation
- Check residual astigmatism (lenticular cylinder)!!

For best distance vision for children and young adults, ROL should be +0.50 to +1.00



Adjusting BC from Refraction OVER Lens

GP laws

- 0.50D change = 0.1mm
- Steeper ADD Minus, Flatter ADD Plus
- Cylinder present in the ROL will remain untreated as with any spherical gas permeable lens design

Plus Power (+) ROL = Steepen BC to Adjust

Example, BC 8.8, ROL= +1.50 sphere

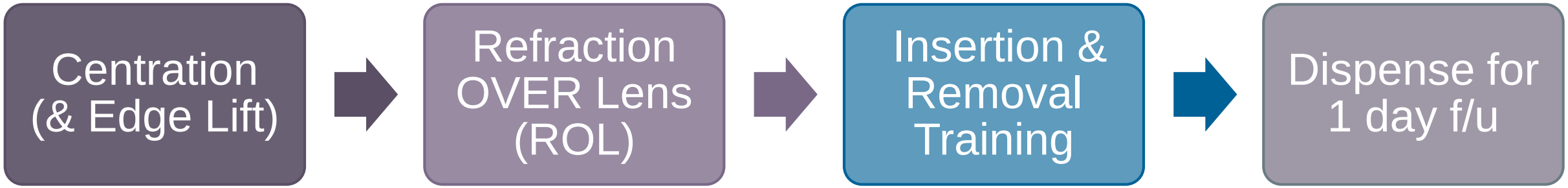
Want ROL = +0.50 (add -1.00 MINUS/0.2mm) , change BC 8.8 → 8.6

Minus Power (-) ROL = Flatten BC to Adjust

Example, BC 9.0, ROL = -1.00 sphere

Want ROL = +0.50 (add +1.50 PLUS/0.3mm) , change BC 9.0 → 9.3

Initial Lens Dispense Overview



- Schedule appointment for following morning (AM) after sleeping in lenses
- Patient returns **with their lenses in eye**

Day 1 Follow Up

Refraction OVER Lens (ROL)	• Still +0.50 to +1.00? • Residual cyl? (unable to correct if through lens)
Centration (& Edge Lift)	• Is the lens moving? • Instill NaFl to observe pattern (Use wratten filter)
Remove Lens	• Visual Acuity? Check Refraction • Slit Lamp Examination – any staining? edema?
Topography	• Day 1 – Baseline • Any lens decentration?

Treatment/Transition

The rate of treatment is not predictable

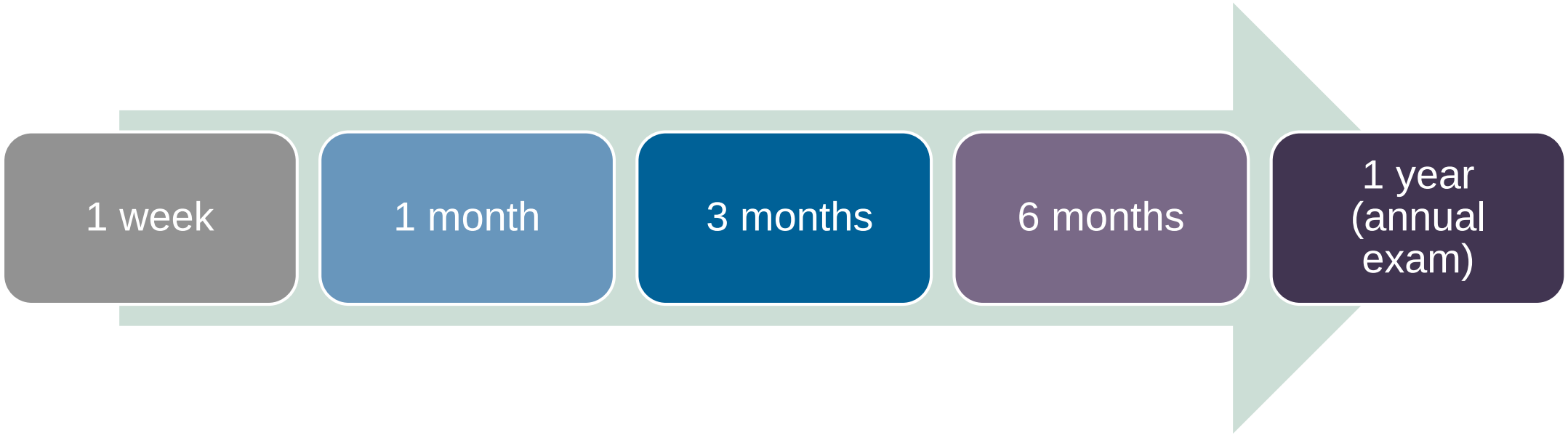
- Average treatment the first night = 2.00 D

- 7-14 days is the average treatment/transition period
  - Lower myopes – within a few days
  - Higher myopes – up to a week

- Vision will regress some during the first day until “corneal mold” is set

- Manage options for VA - temporary soft daily disposable lenses through the day
  - If BC is correct, vision through CRT will be habitual VA

Recommended Follow Up

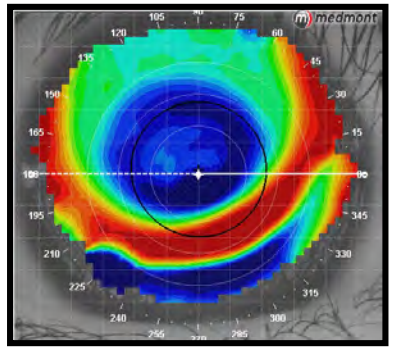


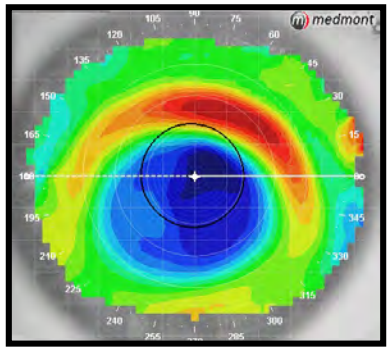
Have patient always return <u>with lenses</u> to check:

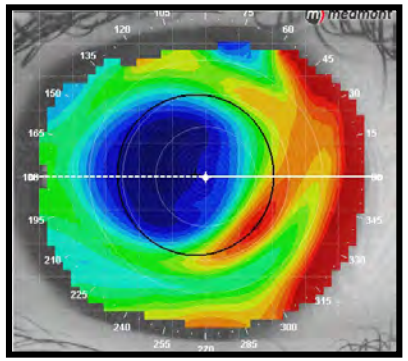
- **optimal treatment**
- **ensure the lenses are clean**
- **patient is following the proper cleaning and disinfecting procedures**

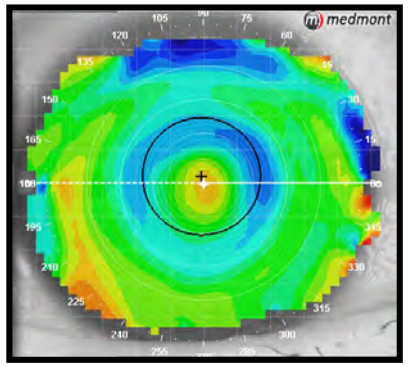
Optimal Fitting Guide Overview

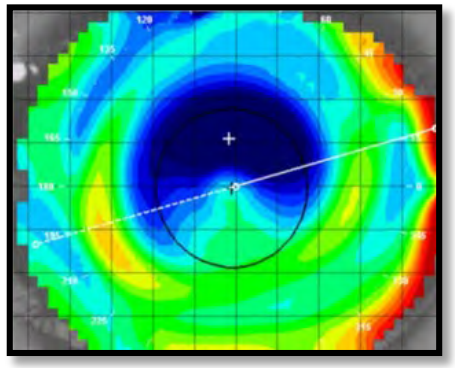
PARAGON VISION SCIENCES





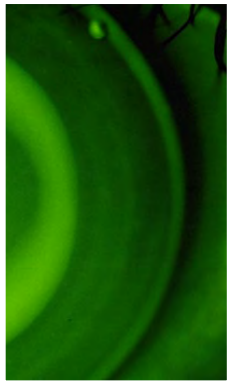




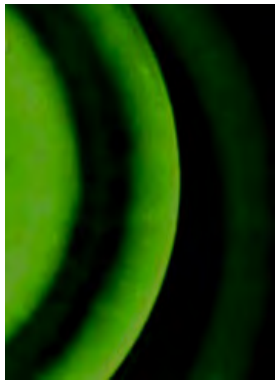


- Lens decentered **SUPERIOR**
  - Increase RZD by 25um
  - 525 → 550
- Lens decentered **INFERIOR**
  - Flatten/ Decrease LZA by 1
  - 33 → 32
- Lens decentered **LATERAL**
  - Increase diameter size (adjust LZA accordingly)
  - 10.5mm → 11mm
- Treatment Zone **TOO SMALL**
  - Decrease RZD
  - 525 → 500
- NaFl bleeding (6 o'clock)
  - Use 2 RZD
  - **CRT Dual Axis** 525 → 525/575

Optimal Fitting Guide Overview

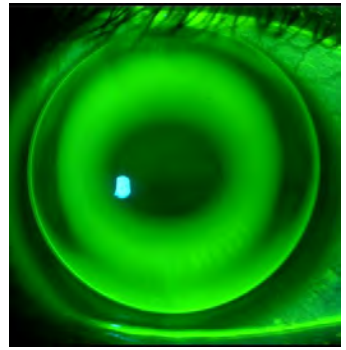


- Lens Edge THIN
  - Flatten/Reduce LZA
  - 33 → 32



- Lens Edge THICK
  - Steepen/ Increase LZA
  - 33 → 34

- Refraction OVER Lens not +0.50/+1.00
  - MINUS (-) ROL, flatten BC
  - PLUS (+) ROL, steepen BC



- Refraction without lens other than plano
  - Check Topography – Incomplete Mid-Peripheral Ring?
  - Use CRT Dual Axis 525→ 525/575

Questions?
PARAGON
VISION SCIENCES

Don’t Make Changes Too Quickly

- Lens centration!
- Parameter adjustments to improve lens centration should be done during the one-day follow up.
- Wait to adjust for under-treatment until 1-week follow up visit
  - Lenses centered
  - ROL +0.50 to +1.00

When to Make Changes

Making First Follow Up Changes

- Decentration – verified by topography

- Unacceptable VA with lenses
  - Lens power/Base Curve
  - Surface/wetting issues

- Discomfort/Slit Lamp Findings
  - Excessive/inadequate edge lift
  - Abnormal staining, edema, etc.
  - Lens adhesion

Make appropriate parameter changes and dispense appropriate diagnostic lens for follow up evaluation

When Not to Make Changes

Do Not Make Changes When:

- Treatment zones are centered
- ROL is acceptable (no minus)
- SLE is unremarkable
- Patient is content & happy
- Under-treatment is apparent at day 1

Proceed to next scheduled appointment with no changes. Order final lenses with warranty.

Great First Few Patients

Ideal Initial 5 patients should be:

- Children progressing in myopia
- Current soft contact lens wearers that complain of dryness or discomfort.
- Spectacle wearers (often contact lens drop-outs).
- In the low to moderate myopia range

  - < -4.00D
  - Flat K's: 42.00D to 45.00D

Proceed with Caution

- Current GP or Ortho-K wearers
- Over 1.50 D of ATR Astigmatism
- Cylinder is Greater than Sphere

  Example: -0.75 –1.75 X180

Final treatment takes Cornea Curves below 38.00D

Example:

- Flat K= 41.00
- MRS = -4.00D
- Target treatment= 37.00 Flat K

Clinical Pearls

Higher myopes (>4.00 D) require centration first, treatment second

- Always sacrifice initial applanation for centration
- Choose an RZD that is 25 microns higher/deeper than the suggested RZD to ensure proper centering for the initial overnight wear. Find the lens number suggested from the slide ruler and select the lens vial in the same BC row to select the deeper RZD.

After moderate treatment (7-14 days), subsequent lenses with reduced sagittal depth (RZD and/or LZA) will center and provide full treatment

3 Quick Steps to fitting CRT/CRT Dual Axis

1) **Total Diameter: HVID – 1mm**
   - >11.8mm, customize with 11.0mm diameter lens
   - Steepen LZA to keep edge lift relationship the same
2) **Corneal toricity > 0.75D → CRT Dual Axis**
   - Especially limbal to limbal astigmatism
3) **Jessen factor set at +0.50 for all lenses**
   - faster treatment , especially for children = flatten BC an additional 0.1mm for a total ROL:+1.00D

Questions?
PARAGON
VISION SCIENCES

Certification Test

1) What is the approximate thickness of the corneal epithelium?

a. 130 microns b. 50 microns c. 80 microns

Certification Test

2) What is the fixed optic zone diameter of the Base Curve?

a. 5.0mm **b. 7.0mm** **c. 6.0mm**

Certification Test

3) Which parameter is never adjusted to change the fit or centration of a lens?

Certification Test

PARAGON VISION SCIENCES

4) What is the target refraction over the CRT lens? (ROL)

a. -0.50 b. +0.50 c. +2.00

Certification Test

5) If the refraction over the lens (ROL) is -1.00D, what adjustment should be made in the Base Curve to achieve a +0.50D ROL?

a. Steepen 0.3mm **b. Flatten 0.1mm** **c. Flatten 0.3mm**

Certification Test

6) Which of the following would indicate the lens with the greatest sagittal depth?

a. 8.5 / 550 / -33

b. 8.6 / 550 / -32

c. 8.6 / 575 / -33

Certification Test

7) Of the following, which is the best option to improve centration of a superiorly positioned lens?

a. Increase RZD b. Decrease RZD c. Steepen BC

Certification Test

8) Of the following, which is the best option to improve centration of an inferiorly positioned lens?

a. Increase LZA b. Decrease LZA c. Flatten BC

Certification Test

9) Return Zone Depths are available in micron increments of:

a. 15 microns **b. 7 microns** **c. 25 microns**

Certification Test

10) A one-degree change in LZA affects overall sagittal depth by

a. 15 microns **b. 25 microns** **c. 7 microns**

Certification Test

11) At dispensing, there is an excessive amount of edge lift. What adjustment is needed?

a. **Increase the BC (8.8 → 8.9)**
b. **Decrease LZA (32 → 31)**
c. **Increase LZA (32 → 33)**

Certification Test

12) At dispensing, there is an insufficient amount of edge lift. What adjustment is needed?

a. **Decrease LZA (33 → 32)**

b. **Increase LZA (33 → 34)**

c. **Change RZD (525 → 550)**

Insert photo of very thing edge lift

Certification Test

13) What is the age restriction for wearing the Paragon CRT® Contact Lens?

a. **No age restriction**

b. **Must be over 18**

c. **Must be over 21**

Certification Test

14) How long is the average treatment period for a new Paragon CRT® Contact Lens wearer?

a. 7 to 14 days **b. 1 Month** **c. 2 Months**

Certification Test

15) When using the Lens Selector Slide Rule, what two components are absolutely needed to determine the correct lens?

a. Steep K / Manifest Refraction Sphere
b. Steep K / Spherical Equivalent
c. Flat K / Manifest Refraction Sphere

Certification Test

16) What patient would be considered a proper candidate based on the FDA approval?

a. **Up to -8.00D myopia, with or without up to -2.50D astigmatism**

b. **Up to -5.00D myopia, with or without up to -2.25D astigmatism**

c. **Up to -6.00D myopia, with or without up to -1.75D astigmatism**

Certification Test

17) When should CRT Dual Axis be considered?

a. **Patient's who display corneal elevation differences**
b. **Patient's who display corneal astigmatism**
c. **Patient's who display incomplete treatment on topography**
d. **All of the above**

Certification Test

18) Which of the following statements is true?

CRT Dual Axis enables you to choose:

a. **2 BC or 2 RZDs to align the cornea displaying corneal astigmatism**
b. **2 LZAs to align the cornea displaying differences in corneal elevation**
c. **2 RZDs or 2 LZAs to align eyes displaying differences in corneal elevation**
d. **2 BC to align the cornea displaying refractive astigmatism**

Certification Test

19) A patient presents to your clinic to be with fit with OrthoK.

- **The right eye's subjective refraction of -3.25DS**
- **Flat/Steep K 44.00/45.00**
- **Corneal diameter size 11.5mm**

What would be the best initial lens selection for this patient?

a) **84/550/600/33**
b) **84/550/33**
c) **84/575/33**
d) **84/550/32/34**

Thank You For Participating in Paragon CRT Contact Lens Certification & Training Presentation

Ljohnson@paragonvision.com