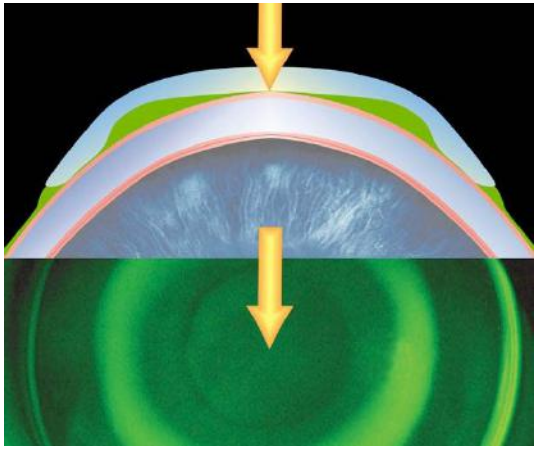
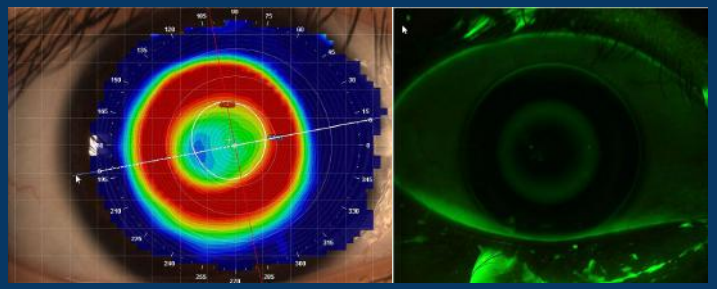
Orthokeratology 101

Optometry MasterClass
ORTHOKERATOLOGY





Ideal Candidates

- #1 most common = myopic children for Myopia management
- I always think of the 80/20

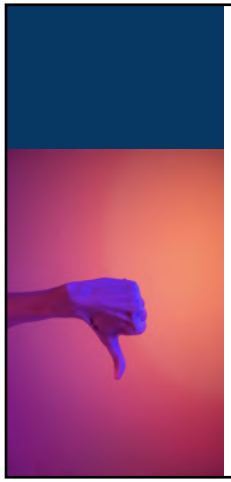
Ideal Cornea and Refraction

- Low Myopes : -1.00 to -6.00
- Low astigmatism: -1.50 WTR or -0.75 ATR
- K values: 40-46
- Corneal eccentricity (rate of flattening): 0.3-0.7

2.1

Glossary

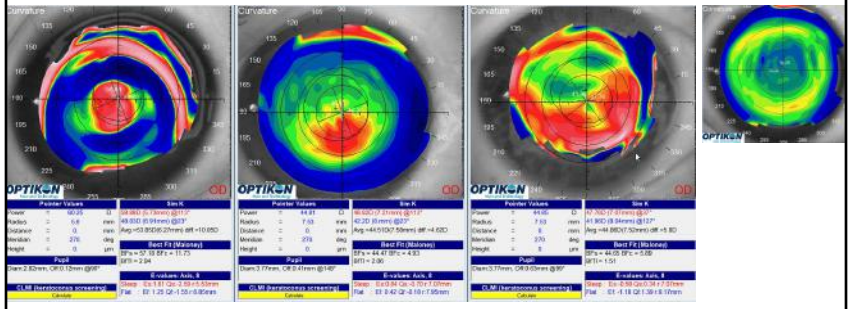
- **Base Curve** = responsible for central flattening. In OK flatter than the cornea.
- **Reverse Curve** = steeper than the cornea, creates an area where the cells can suck into.
- **Alignment curve** = similar in curve to the cornea. It's where the lens lands gently on the eye
- **Peripheral curve** = flat relative to the cornea to allow tear exchange



Poor candidates

- High astigmatism, oblique axis
- Large corneas (>12.5mm) and flat corneas (< 40)
- Unrealistic expectations
- Mismatch between refractive cylinder and corneal cylinder

Keratoconus + INTAC | Mild Keratoconus | Corneal Transplant | Post-LASIK



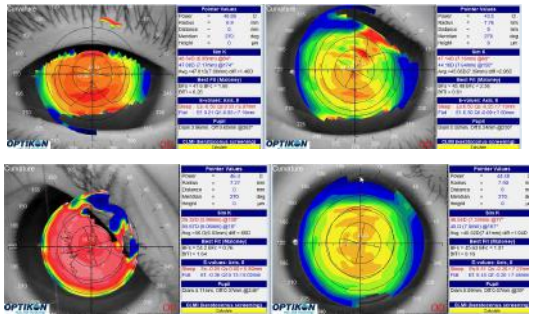
Avoid these corneas for orthokeratology!

2.1

Contraindications

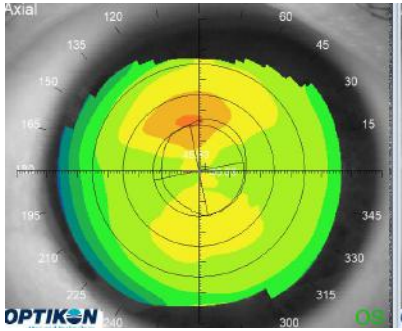
- **Keratoconus, pellucid marginal degeneration, corneal transplants**
- **Disease, injury, or any abnormality affecting the cornea, conjunctiva, or eyelids**
- **Active corneal infections, acute/subacute inflammation of the anterior chamber**
- **Severe dry eyes**
- **Corneal hypoesthesia**
- **Any condition exacerbated by contact lens wear**

All 4 topos are the same patient!

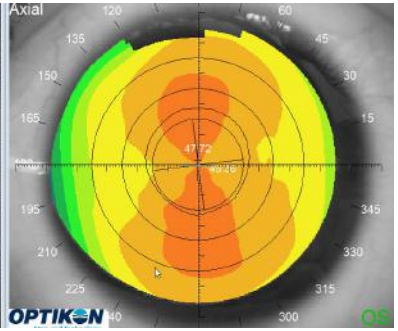


- **Placido based topographies can't capture the cornea… they capture the tear layer**
- **Have them use Refresh Celluvisc a few times a day prior if still not good**
- **Patient can pull down the lower lid, Doc pulls up the upper lid**

Apical Only Astigmatism

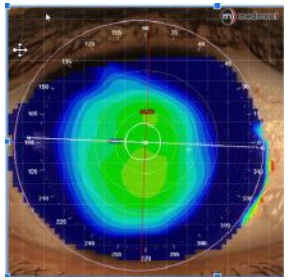


Limbus to Limbus Astigmatism

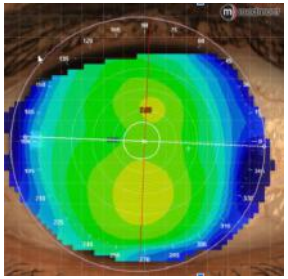


1. Apical corneal astigmatism = EASY!
2. Limbus to limbus astigmatism = harder but still doable! Need toric lens design

Tangential Map

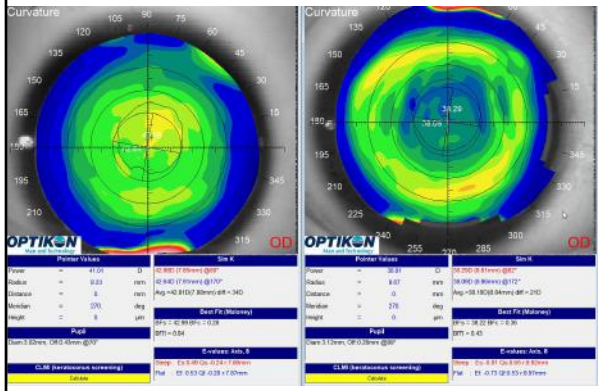


Axial Map (same eye)



- **Tangential tells you exactly as things are. It tells you how OrthoK lenses are fitting and is the MORE important map to look at.**
- **Axial can help show power changes but it smooths the data over and is not as useful to help with you troubleshoot your fits.**

Prolate **Oblate**



Prolate: Steeper centrally and flatter peripheral

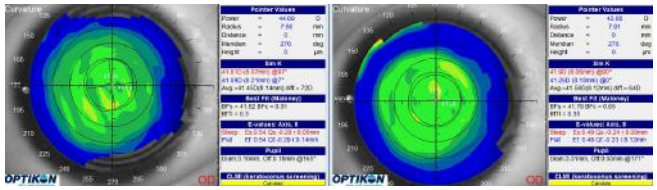
Oblate: Flatter centrally and steeper peripheral

Prolate ecc = 0-1.00
Oblate ecc = <0

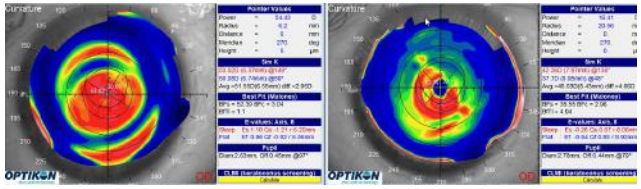
Good Mnemonic: the man upstairs is a “pro”

Corneal eccentricity white board

No RGP Wear(comes in not wearing) RGP Wear (just removed)

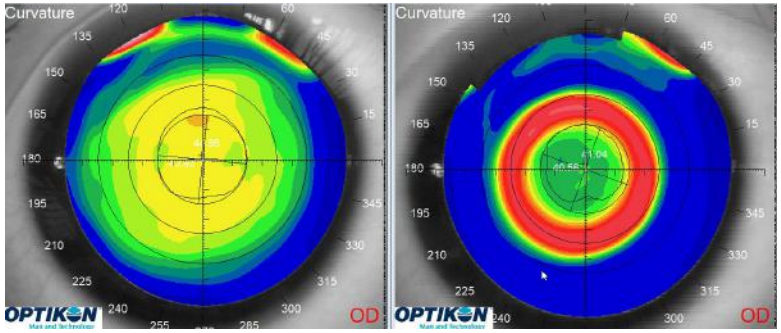


RGP Wear No RGP Wear



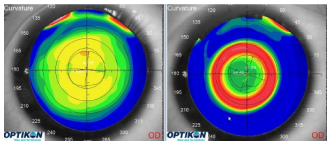
The Perfect Orthokeratology Outcome!

Pre-Treatment Normal Cornea Post-OK Treatment

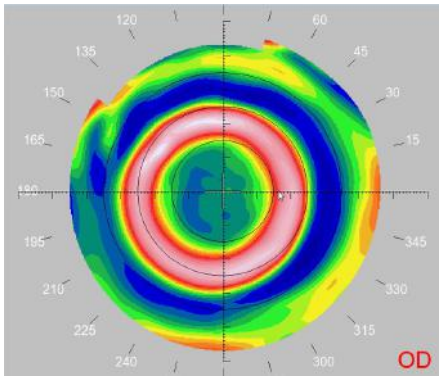


Tangential Maps

Normal **Post-OK**



Difference map



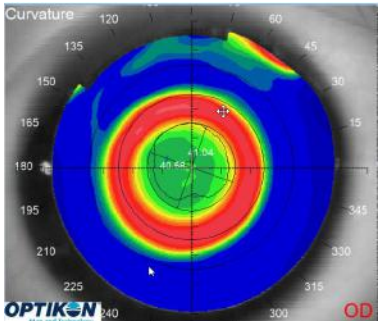
The picture on the right is the "difference" or "subtractive map"

This tells you exactly what changes have occurred!

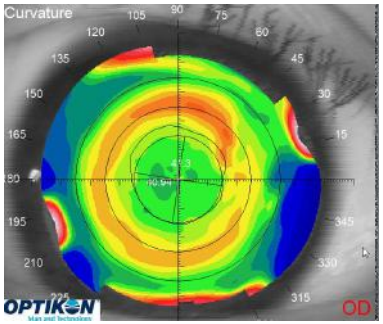
It tells you where the lens is landing and how the lens is fitting

The Perfect Orthokeratology Outcome!

-5.00 Post-OK Treatment



-2.50 Post-OK Treatment



You get less tissue movement, less "red" of a ring with lower prescriptions usually

White Board Time for minus lens on cornea

Empirical Fitting

- You really only need:

Rx | **K's** | **HVID**

Submit to the lab and they send you a lens. Quicker consultations, better fitting "first" experience for the patient.

Fit Set

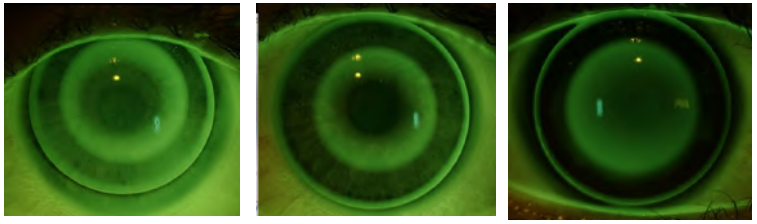
- You use the lens designs' algorithm or nomogram etc to select a lens out of a fit set

Pick a lens from there and check the fit. You can make adjustments on the fly quicker.

OK Dispense Day

- Entering VA, quick Slit Lamp
- Instill Proparacaine before applying lenses
- Apply both lenses
- Add Fluorescein
- Do a QUICK Over-Refraction and VAs with lens on
- Check Fluorescein Pattern and Lens Centration
  - Take photos if you aren't comfortable describing it
- Handoff to tech for Application and Removal training
  - (see Module 3 for tips)
- Give patient Refresh Celluvisc to sleep with at night and Refresh Plus to use in the morning.

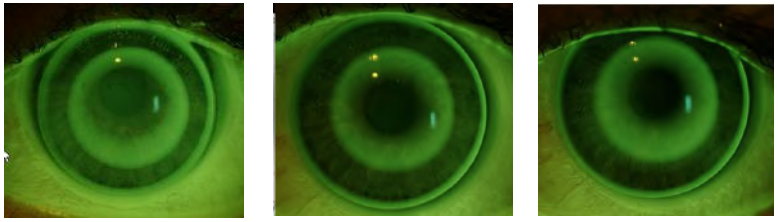
Sup Decent | **Ideal** | **Poor Tx Zone**



- **Check centration**
- **Look at AC, is it a nice black ring?**
- **Look at RC, is it a solid green ring**
- **Is the central tx zone a nice black or is it faint?**

Photos by Euclid Systems

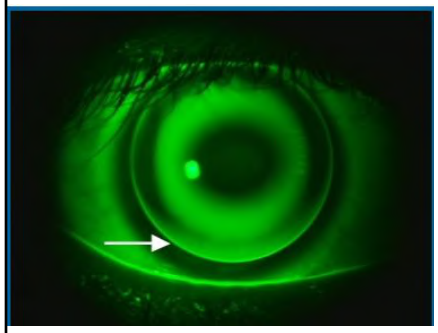
Inf Decent | **Ideal** | **Lateral Decenter**



- **Check centration**
- **See how the lens is compared to limbus**
- **See how the pupil is within the Rx zone**

Photos by Euclid Systems

Need Back Surface Toric Lenses



Photos by Paragon Systems

- Lens is more loose inferiorly than superiorly
- It is WTR! WTR corneas have flat meridians horizontally and steeper vertically. Because the cornea is steeper vertically it makes sense that a spherical OK lens will land "looser" vertically as you can see the green color seeping into the alignment curve.
- If >1.00 corneal cyl : consider toric

Refresh Celluvisc

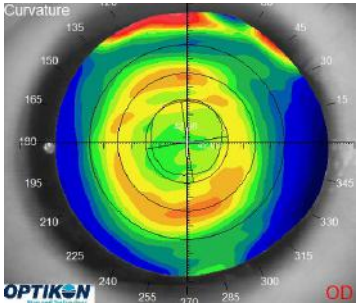
- Improves comfort which helps compliance
- Relieves dryness
- Helps the fit and treatment!
  - Reduces chances of air bubbles

Lens Care and Removal

- Hydrogen Peroxide daily - no Hydraglyde
- Rinse with saline or Biotrue.
- Give patient DMV remover

1 Day OK FU

- **I tell patients I am happy with HALF of the prescription reduction**
- **Unless the patient has to drive in themselves. Patients can come WITHOUT the lenses on. (if an adult however, I have them wear the lenses in if their uncorrected is not adequate to drive)**
- **I demonstrate current unaided VA today versus yesterday (patients love it!)**
- **Expect a messy topography… it's ok! Most of the time, you won't change anything yet.**
- **Reassure the patient you are heading in the right direction.**

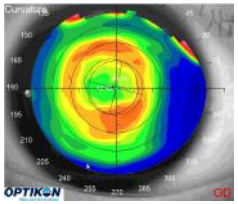


Example: see soft ring where the reverse curve is and soft landing at alignment curve

Loaner Glasses or Soft Contacts

- I give loaner glasses to patients to get them by temporarily.
- If I have to, I'll dispense temporary soft contact lenses but there are problems with this
  - Can slow down the molding effects of OrthoK
  - They might be new to wearing soft contacts and you have to train them ALSO on that
  - I'd rather avoid them wearing a nighttime AND daytime contact lens
- Make -2.00, -3.00, -4.00 sph OU at a minimum.

Before



After

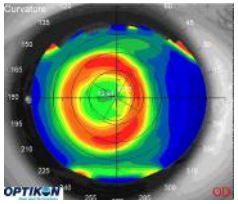
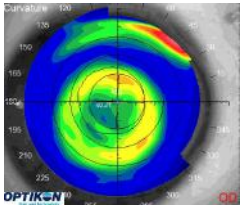


Photo from Paragon certification

Superior Decentration

- Lens is riding too high -> indicates too flat
- Steepen the lens at the reverse curve and/or alignment to center it
- See the Before and After: less “green” or looseness at where the Alignment curve should be by steepening.

Before



After

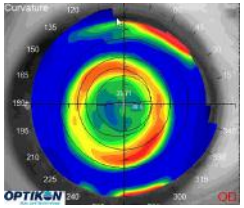
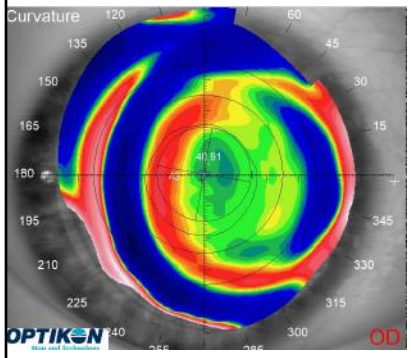


Photo from Paragon certification

Inferior Decentration

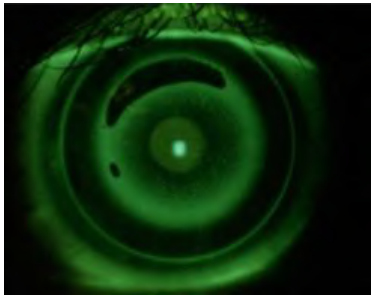
- Lens is riding low = too steep
- Flatten the lens at the alignment curve to raise it up
- Increase the overall diameter



Lateral Decentration

- Lens will cause unwanted under correction, astigmatism, distorted vision
- Correct by increasing overall diameter (best way) or by steepening the lens at the reverse curve

Tight Lens and Air Bubbles



At times the reverse curve is too tall or the alignment curve too tight that does not allow tear exchange.

You are left with a bubble like this on the fluorescein pattern

In general you’d want to flatten the lens

Photo credits: Paragon

When to Consider Toric OrthoK

- At the 8mm chord, if there is more than 30 um of elevation difference between the principal meridians
- It matters much MORE than the keratometry values. If there is 2.50 diopters of cylinder but the cornea is completely the same elevation at the 8mm mark. Then you can do fine with a spherical OK lens

Photo credit FIACLE Premjit Bhaka

Dimple Veiling

Temporary problem:

Caused by an excessively steep and tight lens that traps bubbles

Lens has poor tear exchange at the peripheral curve as well

Fix is to loosen the lens.

Lens Binding

At times the lens can be too difficult to remove in the morning.

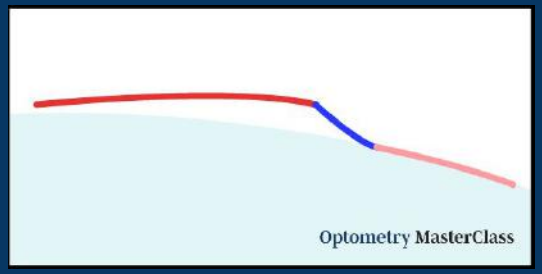
Advise the patient wet the lens before removal with artificial tears. Use the eyelids to try to break suction before attempting to remove the lens

Lens redesign can be warranted if too tight: increase the lens edge thickness and/or loosen the peripheral curves

Keep Track of Your Lens Changes

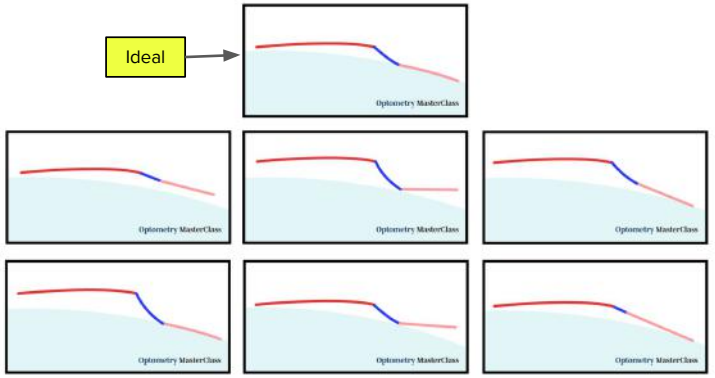
- Keep track of the lens designs and make note of each one
- I call the first set Manufacturer OK R1 and L1
- Each subsequent lens I will label as “Manufacturer OK R2/L2” and there will be a note of what I changed “increased sag 15 microns at the RC”

The Ideal Fit



Red = Base curve (BC)
Blue = Reverse Curve (RC)
Pink = Alignment Curve (AC)

Find the deadly sin and you can fix almost anything!

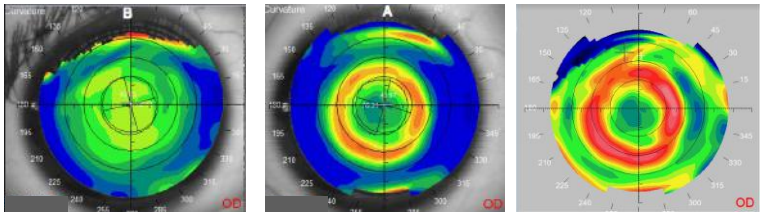


Checking for Myopia Progression

- **The best way is to measure the axial length**
- **But if you don't have one and don't want to wash the patient out**
  - Have them put on the lens and do an over-refraction. If it shows more minus than your previous over-refraction over the same lens. It can indicate myopic progression.

CASE Changing Just One Meridian

Pre Tx | **Post Tx** | **Difference Map**

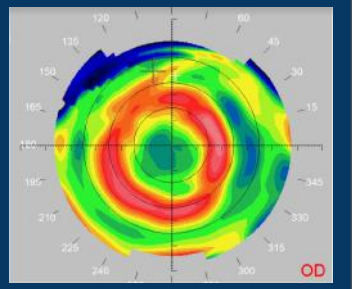


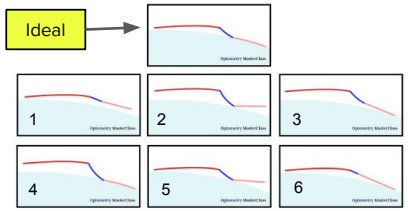
Patient is -4.00 x -1.00 x 160

Post treatment: -0.25-1.00 x 160

So not bad, just need to clean up the WTR cylinder. You usually do that be increasing treatment vertically by tightening the alignment curve there. You see the green here it is a touch loose.

Difference Map shows how the lens lands



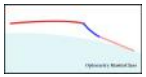


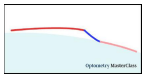
1. Slightly looser inferior and superior which matches the residual WTR cylinder.
2. Superiorly looks like #3 (see blue further away?)
3. Fix by increase Sag at RC and flatten AC vertically only, added prism to make sure lens is oriented correctly.

CASE Changing Just One Meridian (continued)

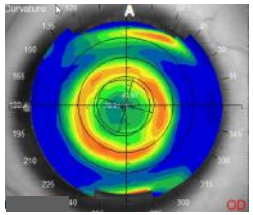
Len#1 Lens #2

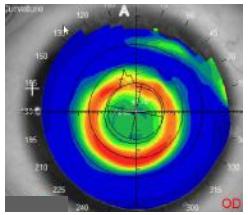
Vertically





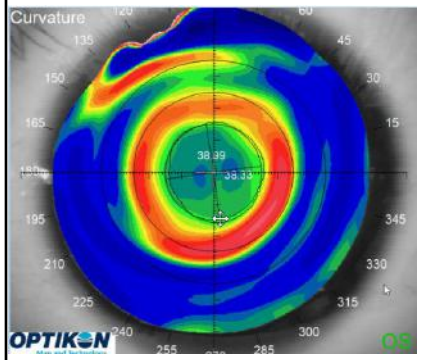
Horizontally



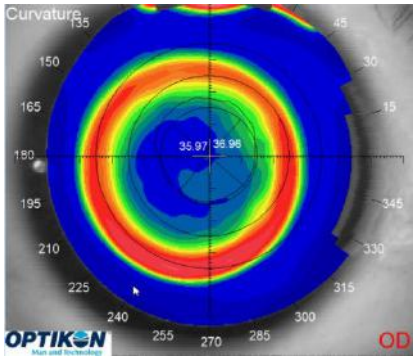


Steepened the RC vertically but flattened the AC vertically and BOOM. Nailed it. Plano sph with lens #2. Could try flattening AC first as well by itself.

MM Patient



Adult Patient



Huge Thanks!

Arigato!

Danke!

Grazie!

Cam On!

drmai@insightvisionoc.com!