

# Toric Ortho-K, toric bifocals, irregular toric CLs and other crazy toric fits

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# Objectives

To review the astigmatic conditions of human eyes by topography.

To discuss the mechanical and physiological disadvantages of rotation-symmetric RGP contact lenses on regular and irregular astigmatic eyes.

To provide the necessary knowledge how to fit toric, toric bifocal, irregular toric and toric Ortho-K CLs on regular and irregular corneas.

To introduce new developments coming out of todays research for tommorows practice of toric CLs, toric bifocal CLs and toric Ortho-K CLs.



# Time table

Introduction and learning objectives	4'
Definition	6'
Challenging situations	14'
Disadvantages of rotation-symmetric CL	8'
<b>Short Break</b>	2'
Fitting technology	8'
Clinical cases # 1 - 6	22'
<b>Short Break</b>	2'
Clinical cases # 7 - 12	22'
Conclusion and Discussion	5'



# Introduction and Background

Dipl.Optometrist/Contact Lens Specialist (SHFA)

Master of Science in Clinical Optometry (PCO)

Master of Medical Education (University of Bern)

In Privat CL practice since 1989



Professional Head of the CL department at  
the University Eye Clinic Basel since 2000

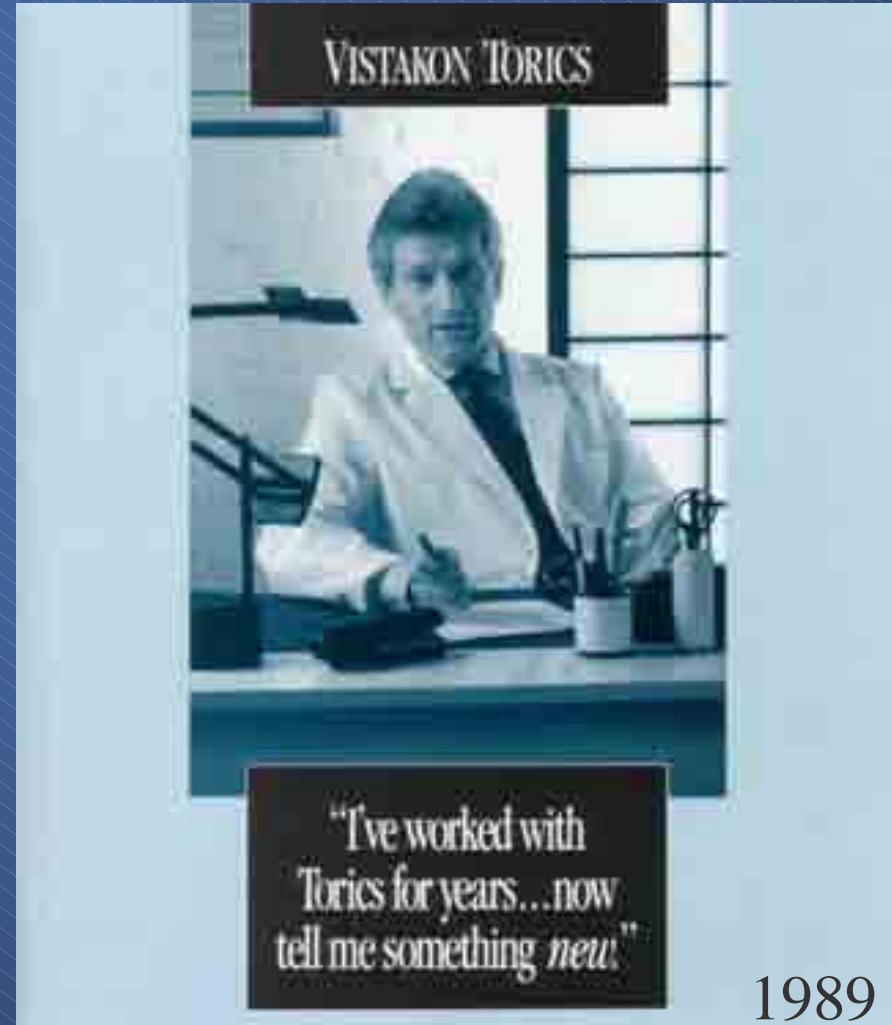
CL fitting rate : 50% RGP  
50% Soft CL



Optometrist and Laser technician at  
the VISTA Eye Clinic Basel (2002)



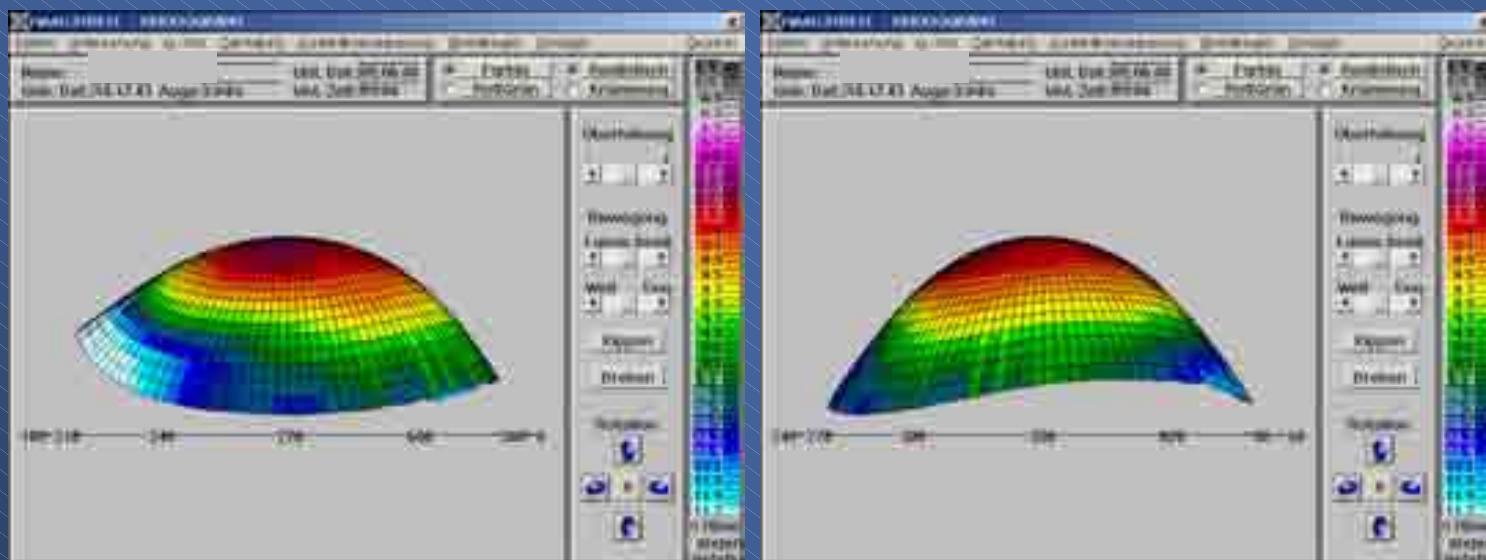
# Tell me something new about torics



# D e f i n i t i o n

## Regular astigmatic cornea

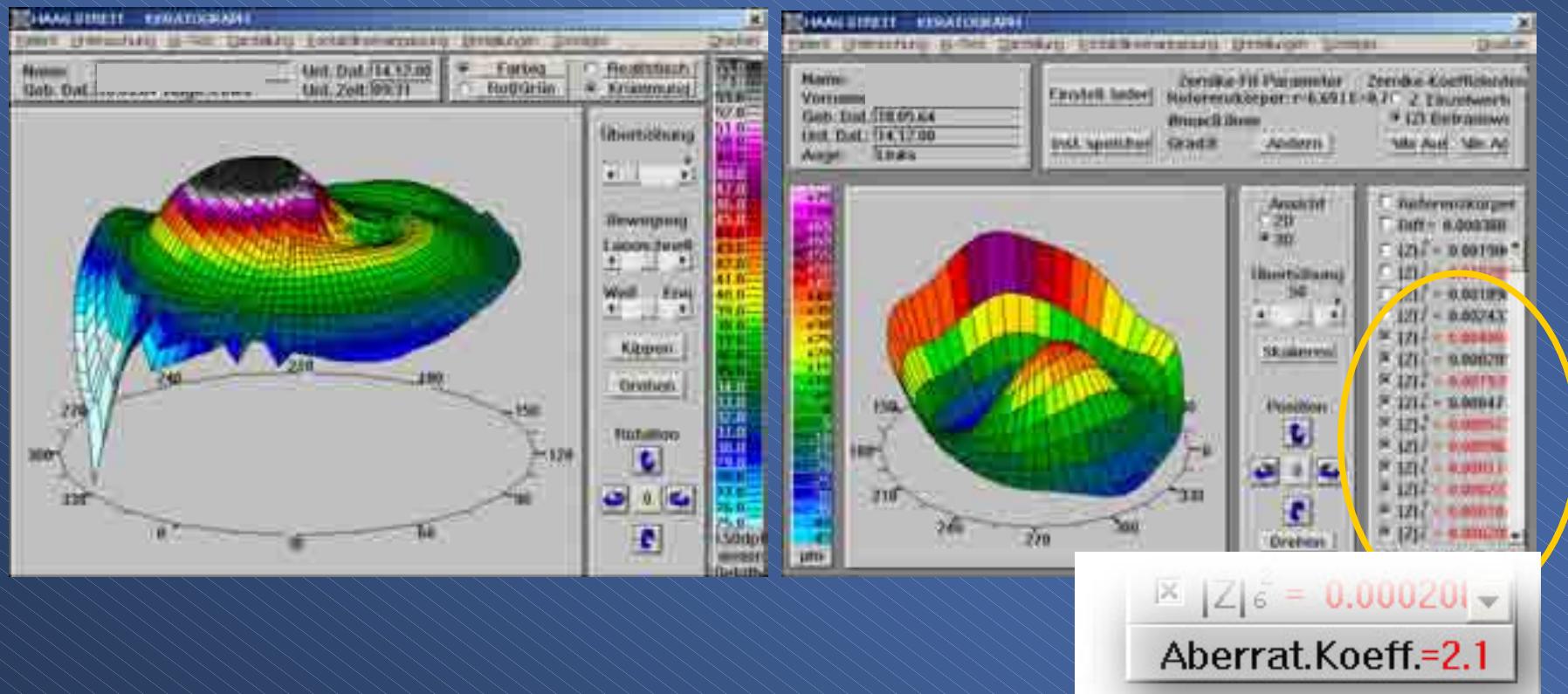
Every single meridian is defined by an individual,  
but regular, curve with a defined focal point



# Definition

## Irregular astigmatic cornea

The curvature is in every single meridian irregular and therefore no single meridian has his defined focal point.

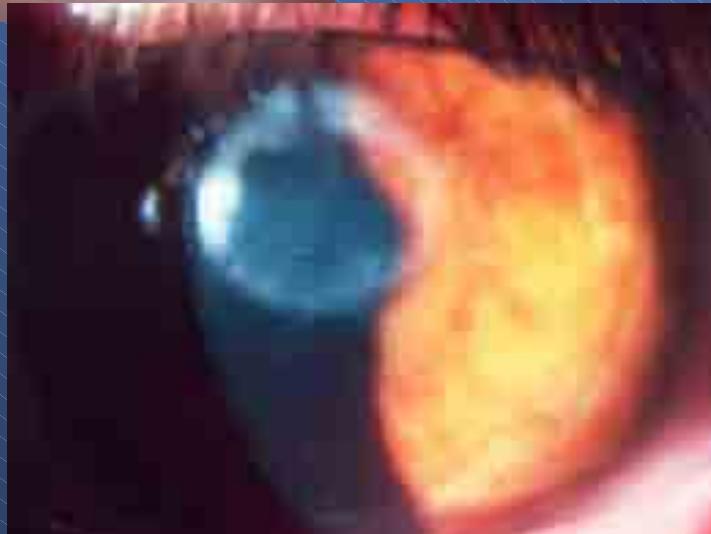


# Irregular astigmatism

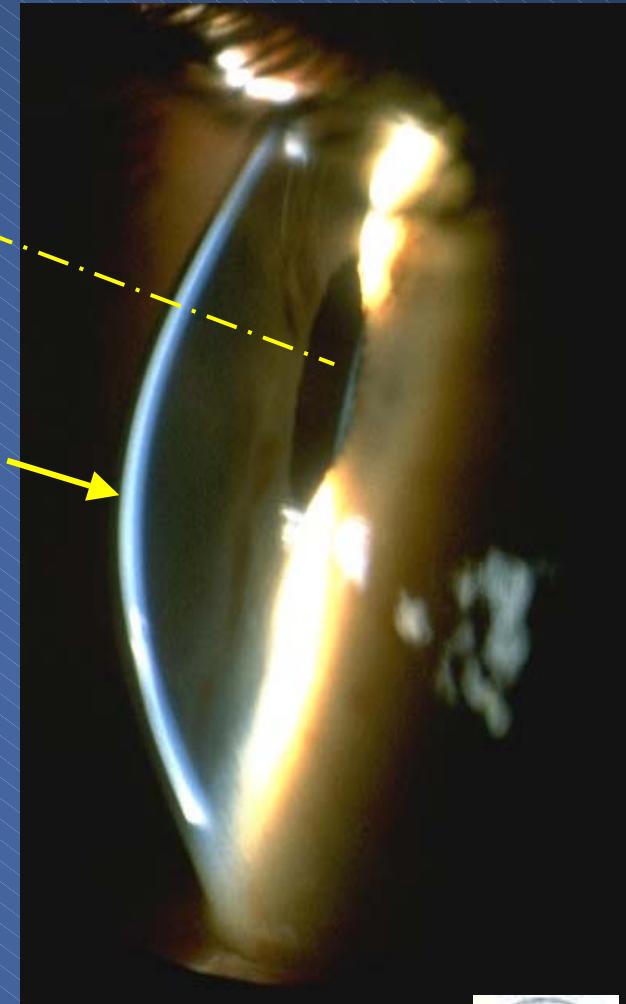
Cause of trauma: Cat



Infection



Keratokonus



Optical Axes  
Center of  
Pupil

Apex caudal  
decentered



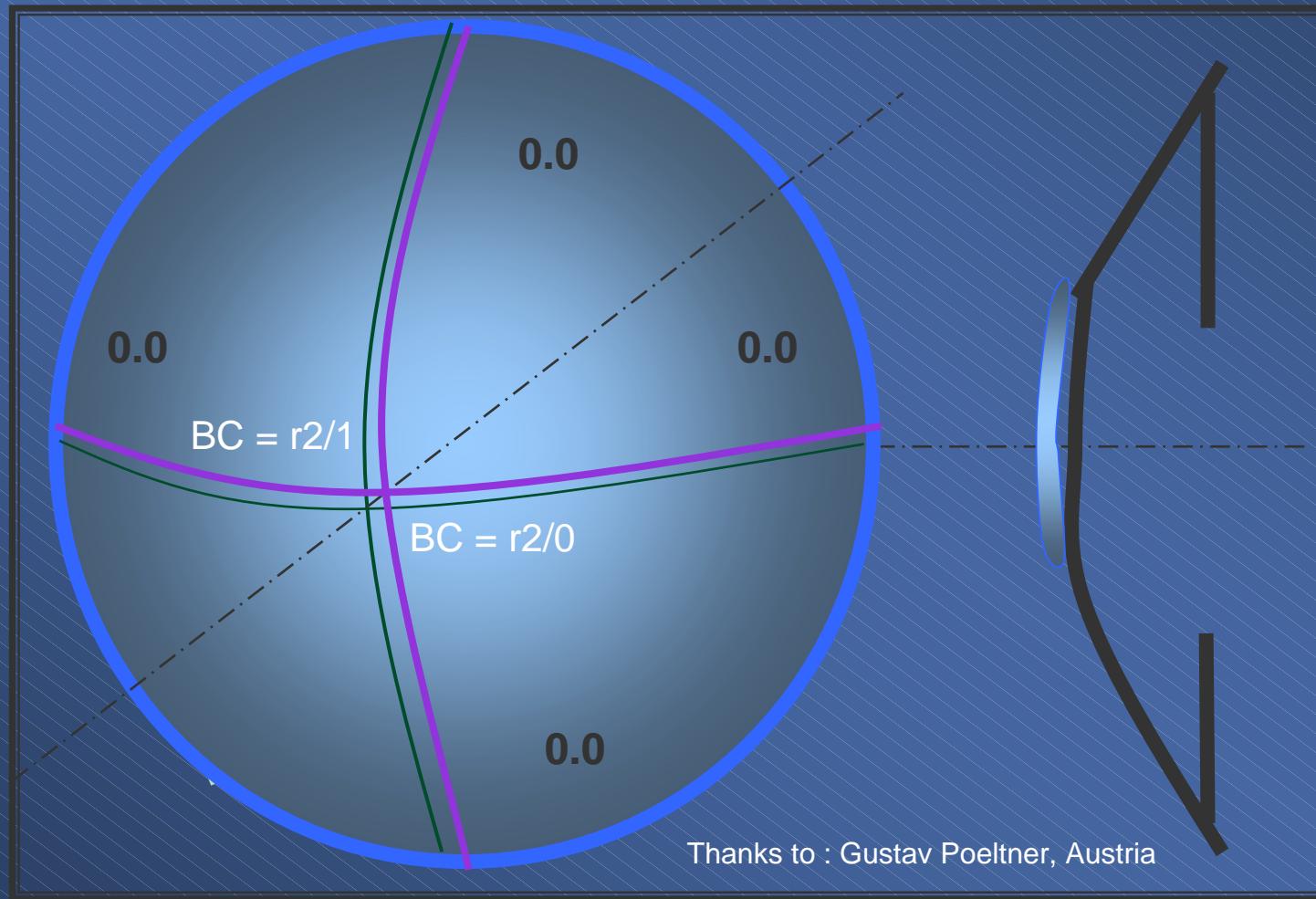
# Definition

Contact lenses should be fitted so  
as to minimally disturb corneal  
and conjunctival physiology.



# Definition

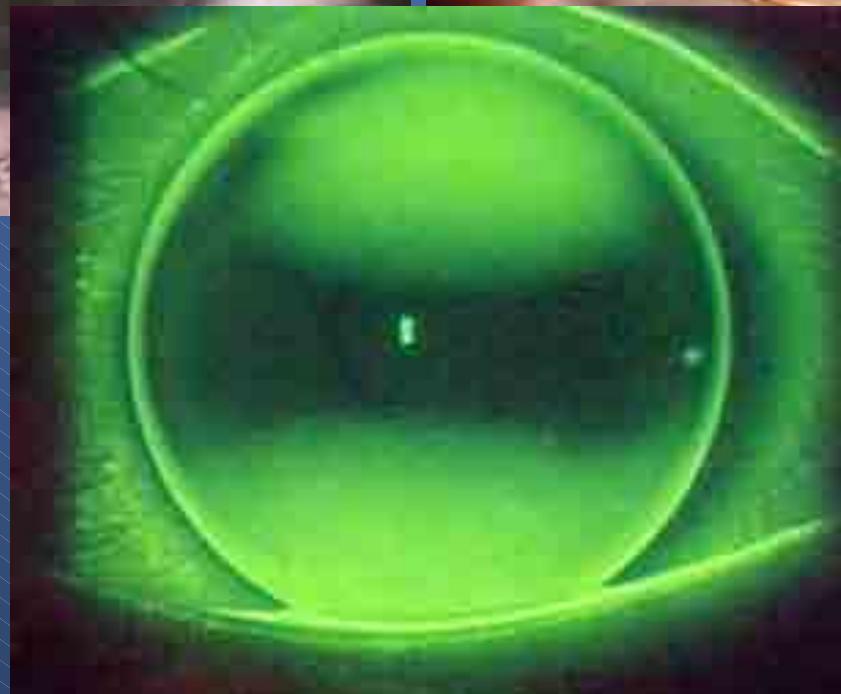
Contact lenses should be fitted on an alignment standard



Thanks to : Gustav Poeltner, Austria

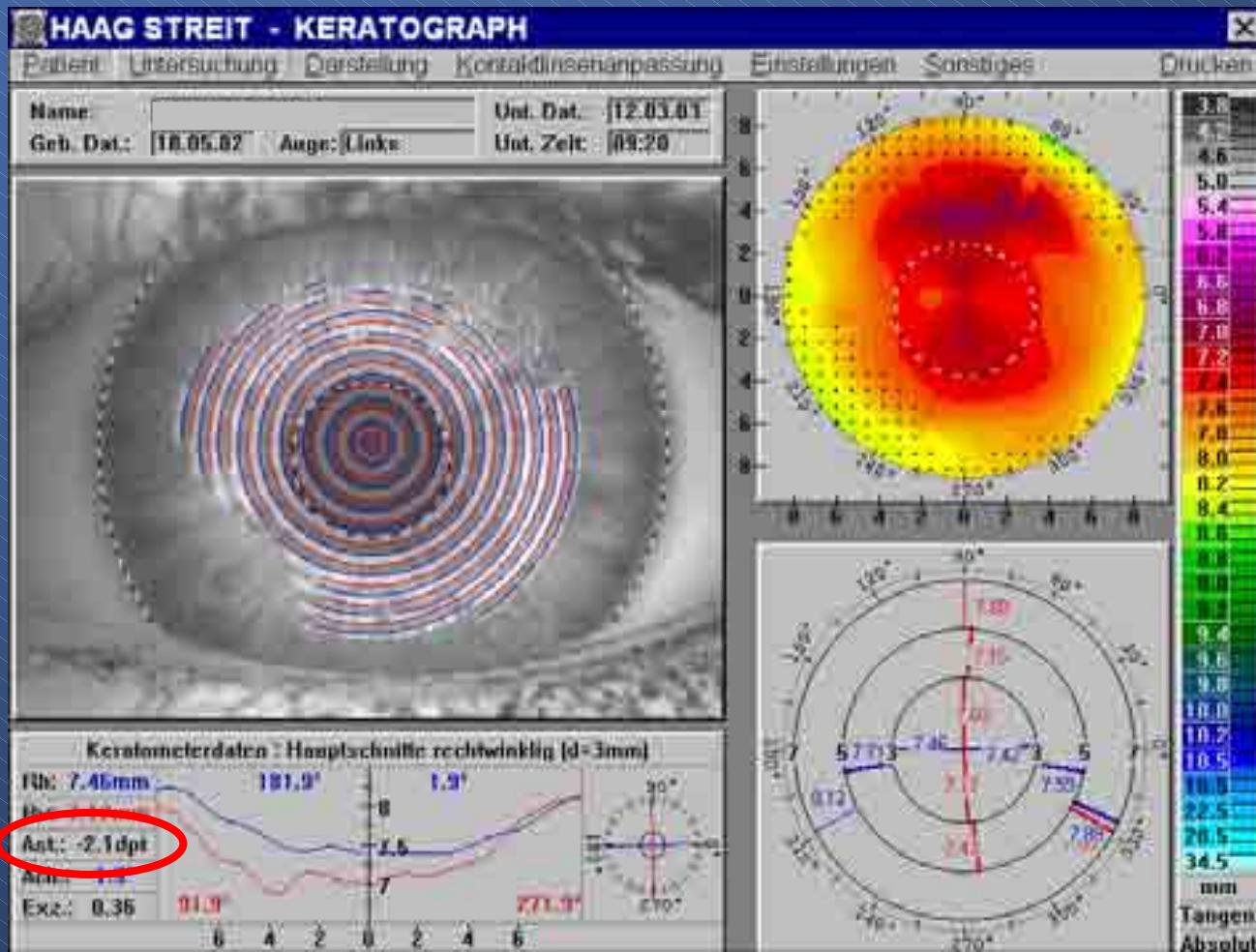


# Definition



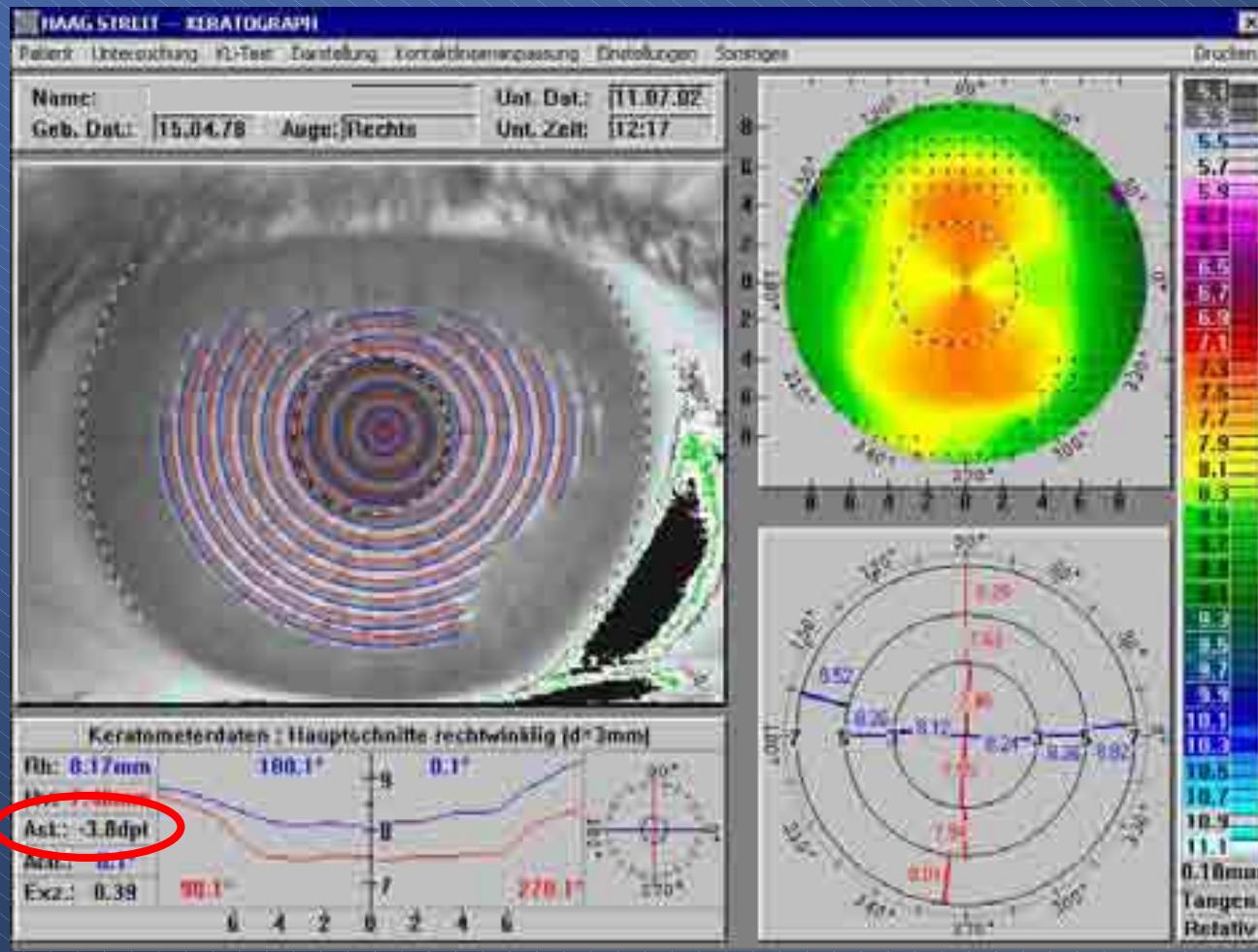
# Challenging situations

Low regular astigmatic cornea <2,5 dpt



# Challenging situations

Higher regular astigmatic cornea >2,5 dpt



# Challenging situations

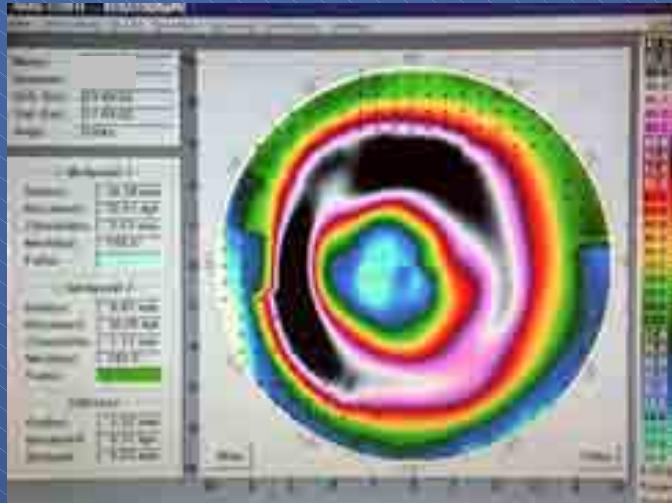
## Irregular Astigmatism



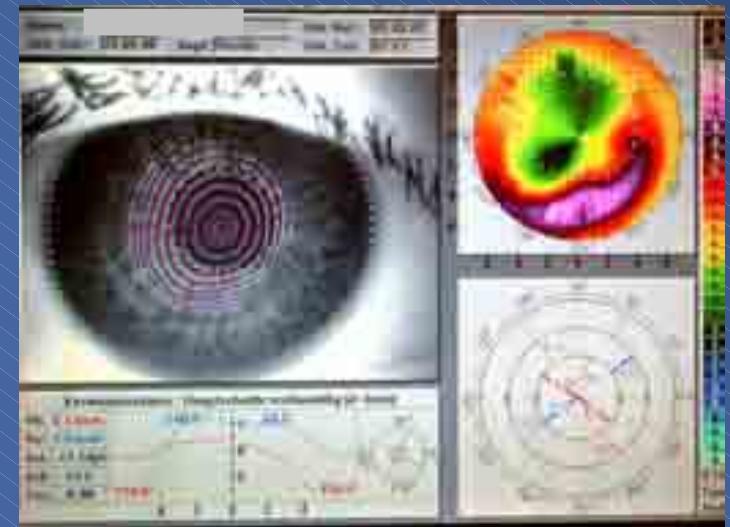
# Challenging situations

Post-  
LASIK  
- 5,77 dpt

Irregular corneas after surgery



Post-penetrating Keratoplasty



Post-Trabeculectomy



# Challenging situations

Presbyopic CLs for astigmatic eyes

Too high



Too low



# Challenging situations

CLs for irregular aphakic astigmatic eyes

Aphakic Child 4 y/o



# Challenging situations

Ortho-K CLs for astigmatic eyes



# Disadvantages of rotation-symmetric CL



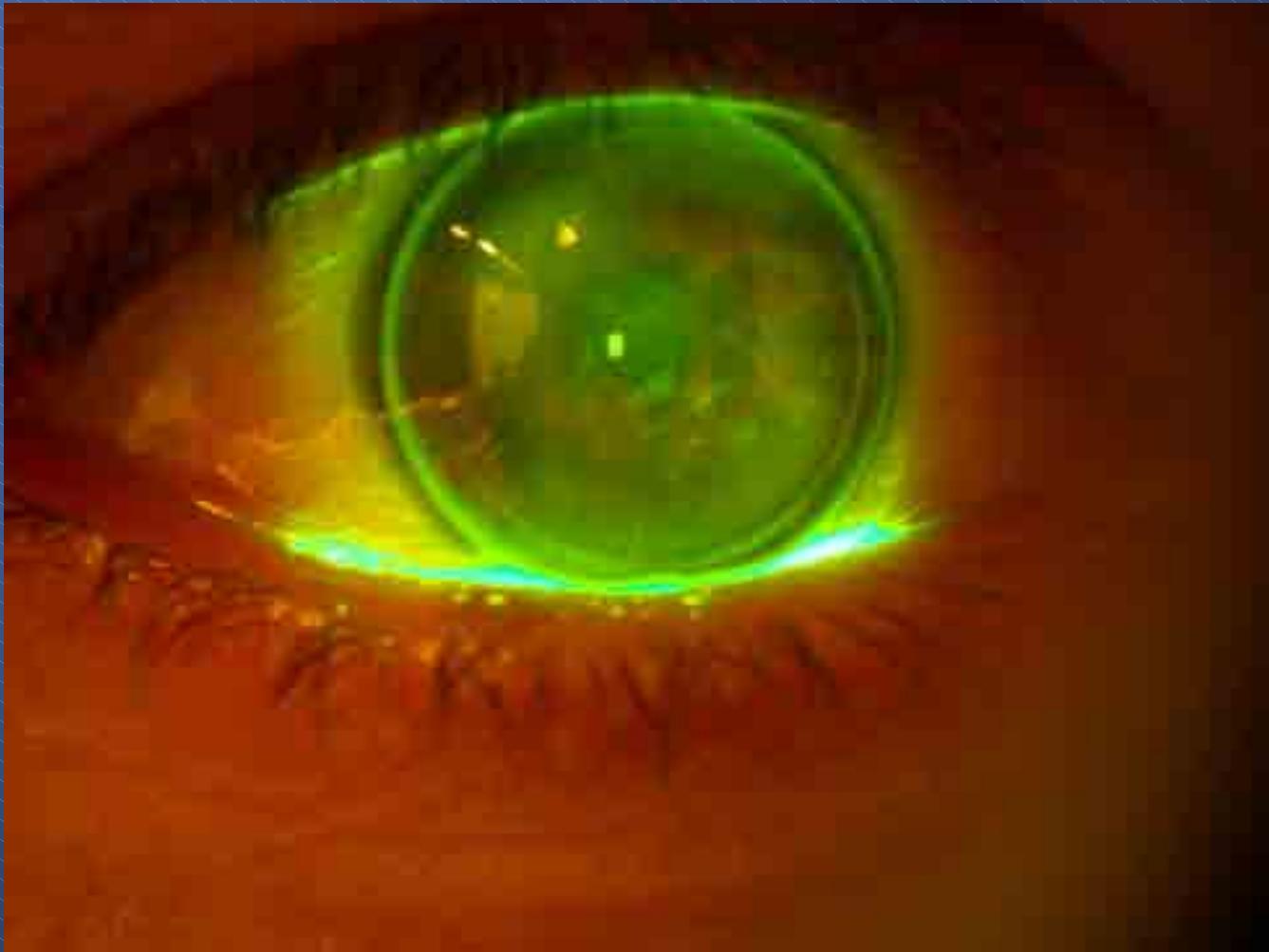
Happy lens ?



# Loss of lenses



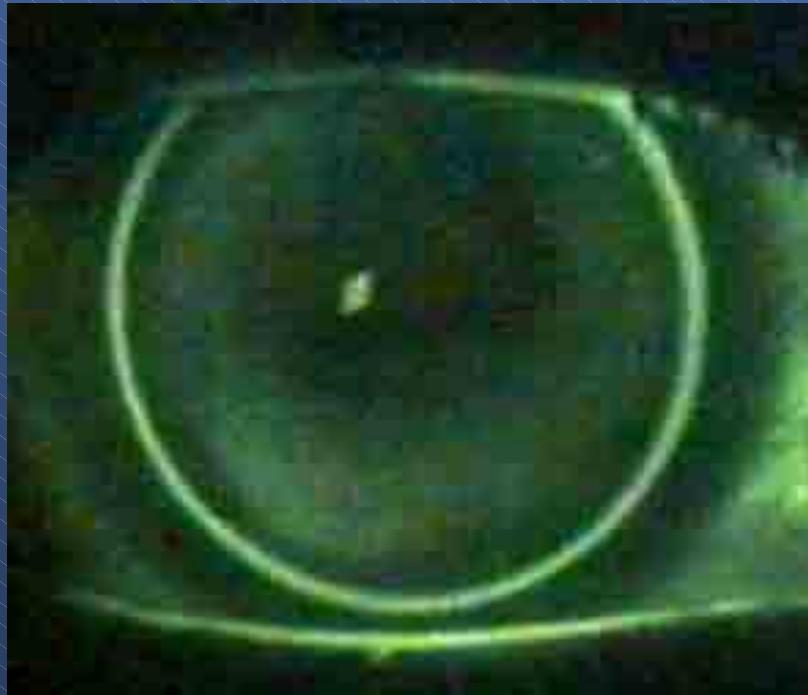
# Foreign body behind the lens



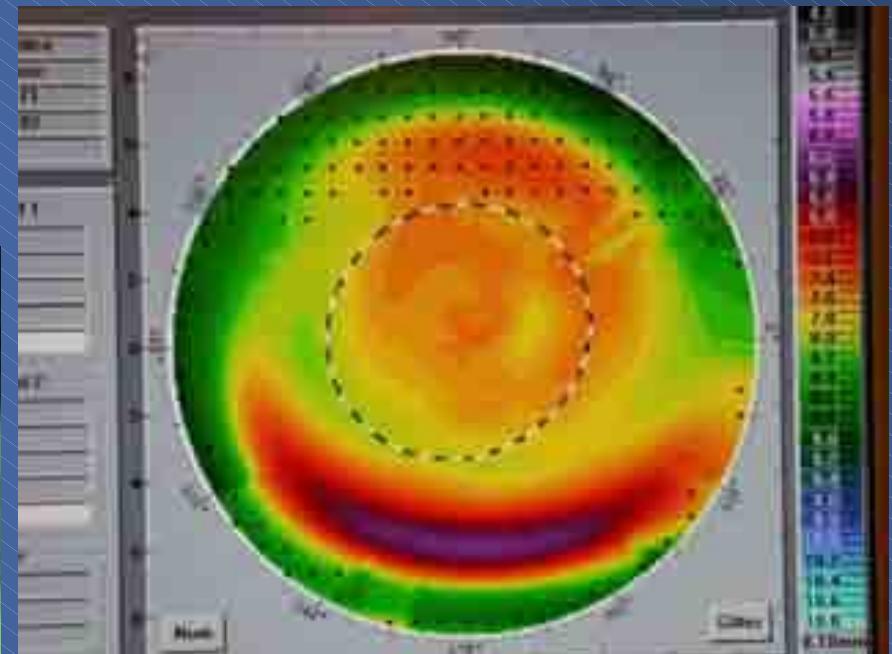
# Refractive changes

## Complications

Deformation after time



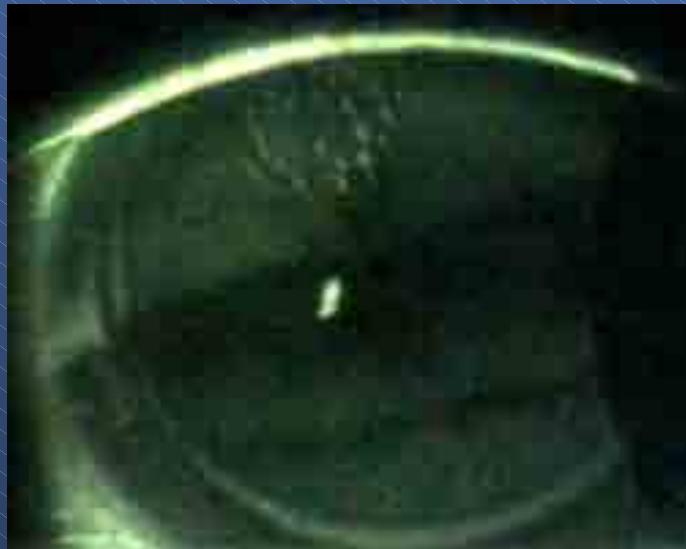
## Distorsion



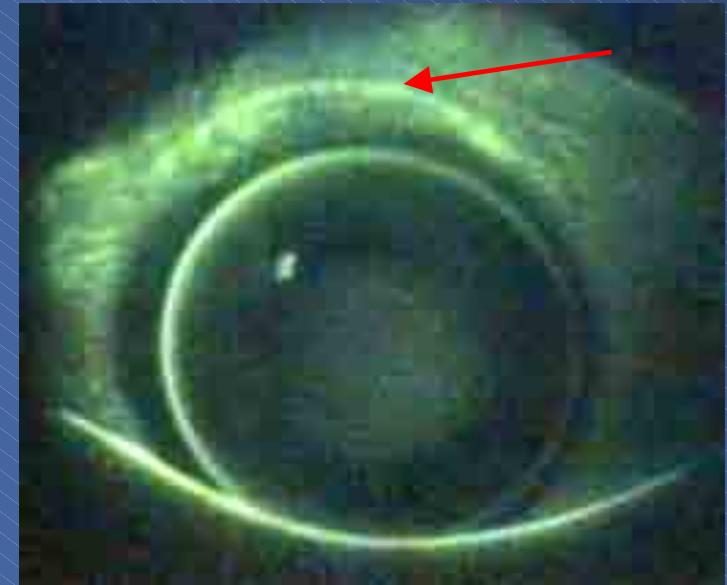
# Stressed physiology

## Complications

### Sticking lens



### High Rider



# Stressed physiology



3/9 o'clock  
Staining

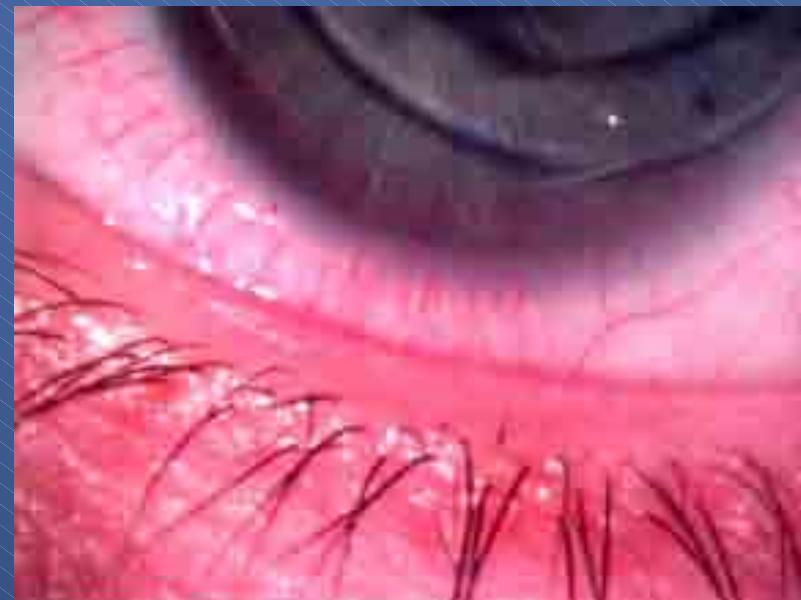


# Stressed physiology

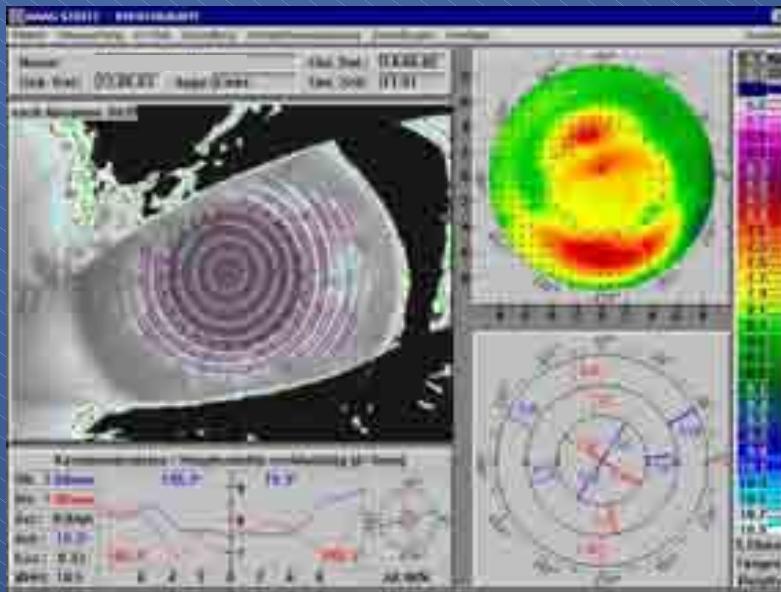
3/9 o'clock staining



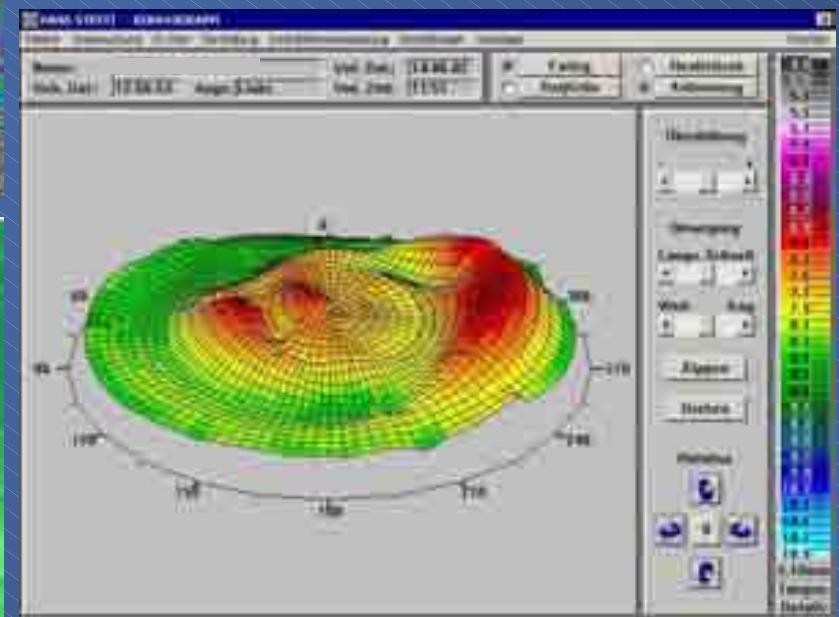
Neovascularisation



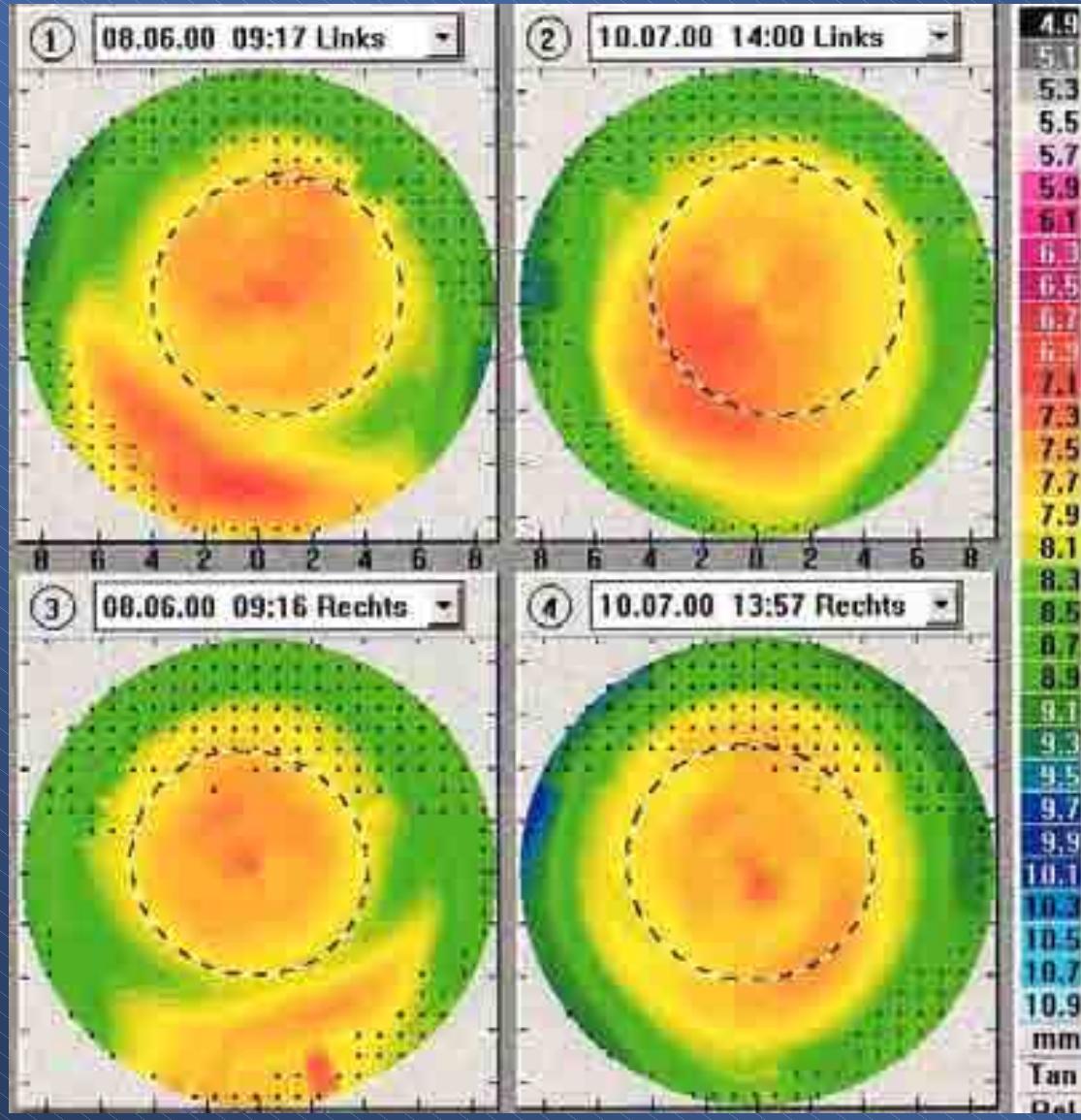
# Distortion and warpage



Refractive  
changes and  
spectacle blur



# Distortion and warpage

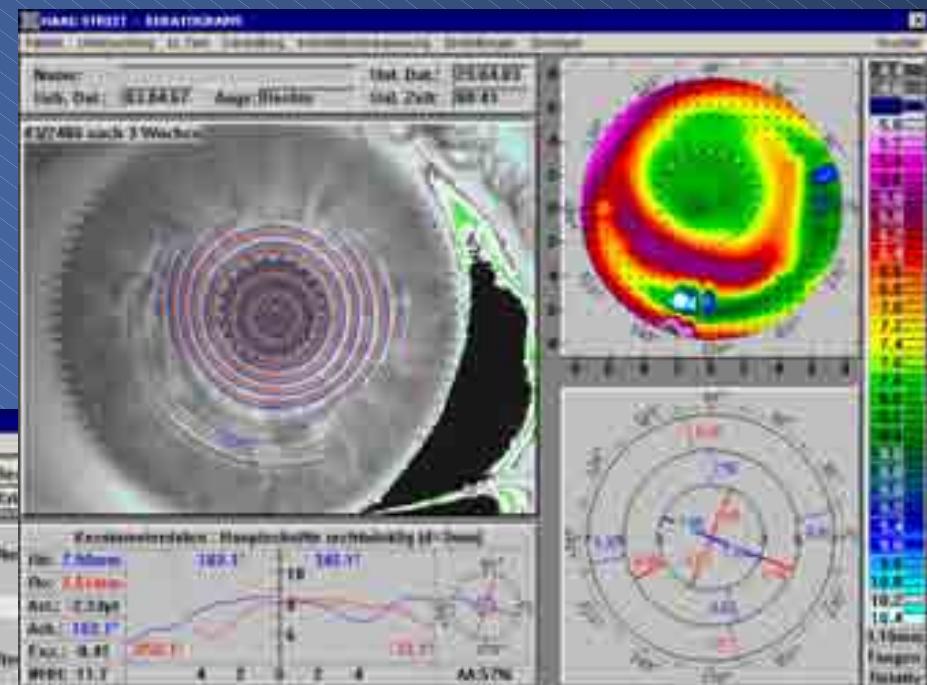
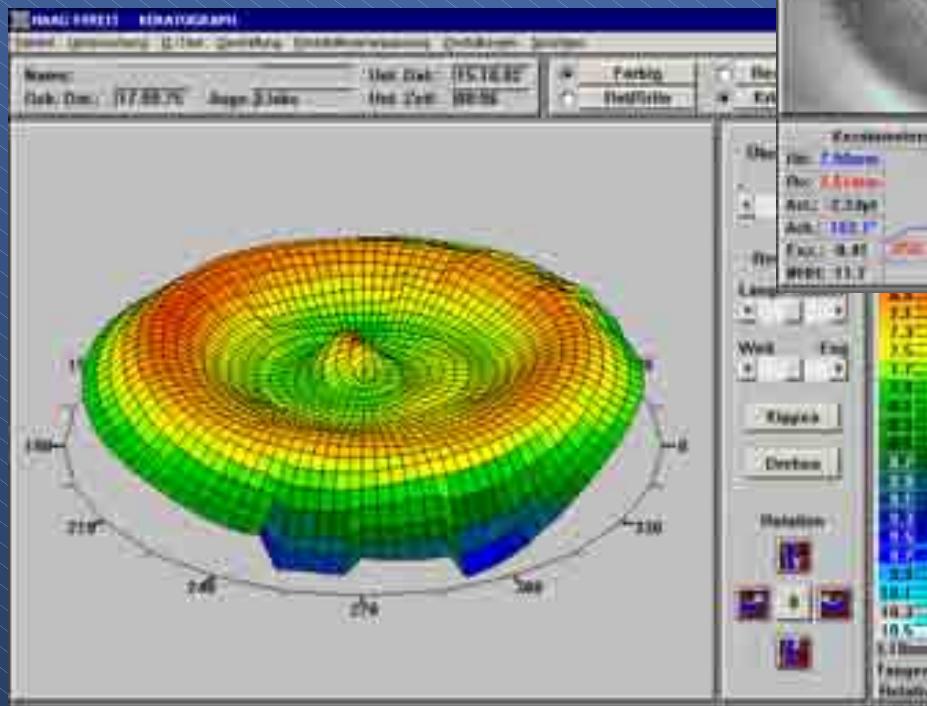


Redistribution of  
epithelial cells

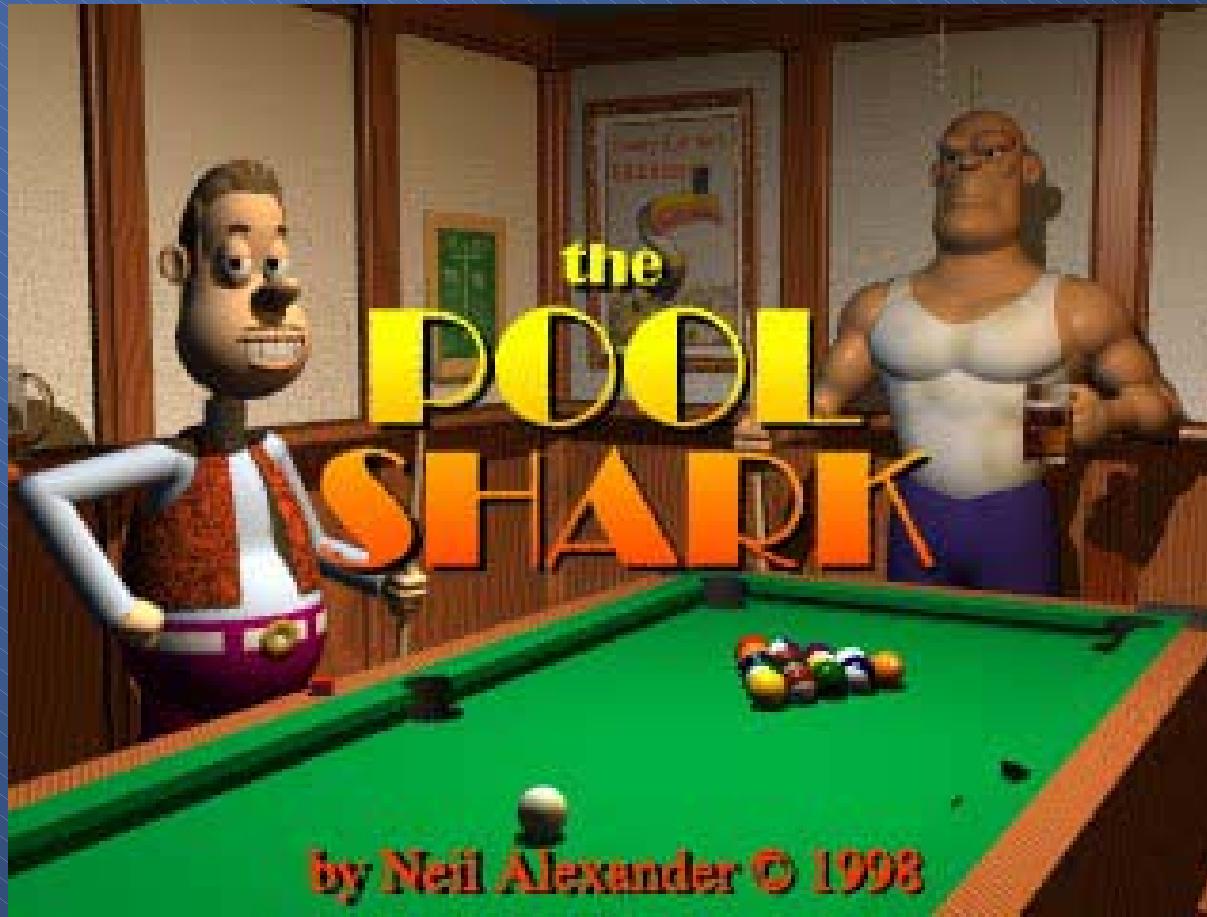


# Reduction of unaided VA

Dislocated and  
warpaged  
therapeutic zone



# Fitting technology



After a short break !



# Short Break



# Analysis of astigmatic corneas

Keratometry

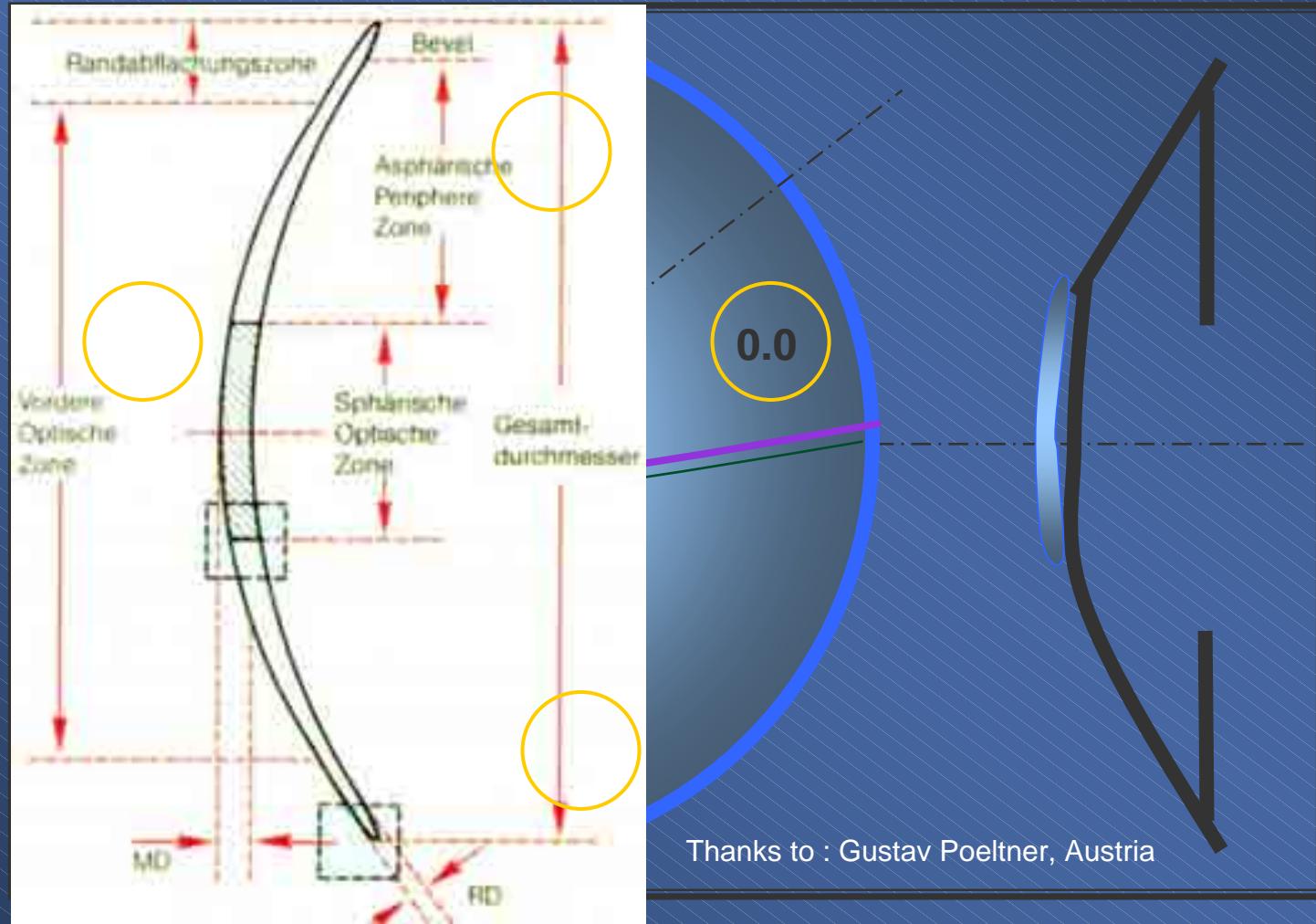


Topography

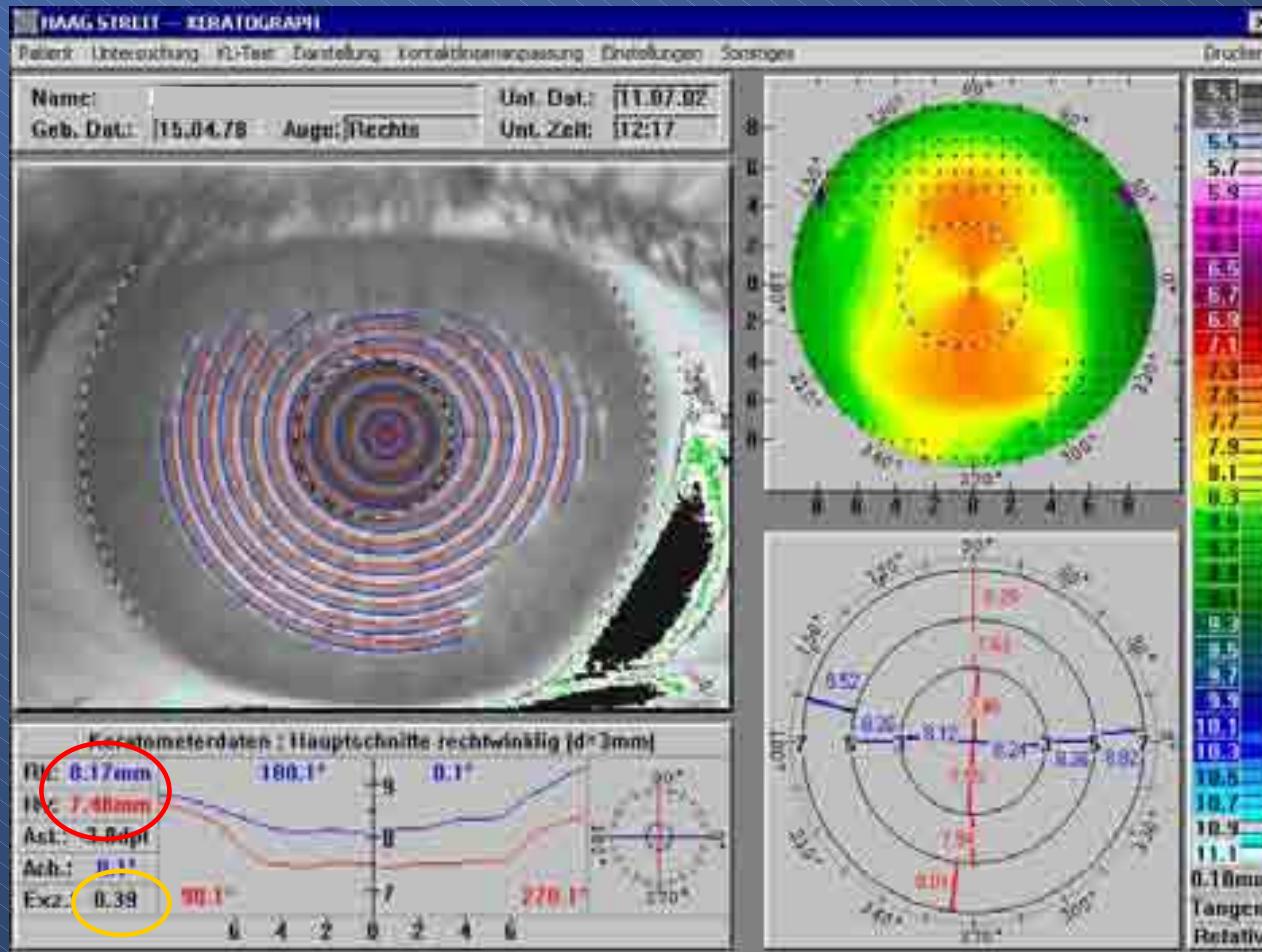


# Toric designs

Two different basecurves



# Toric designs



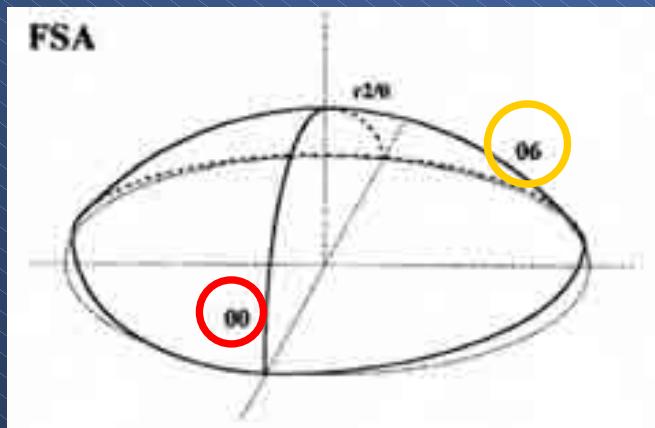
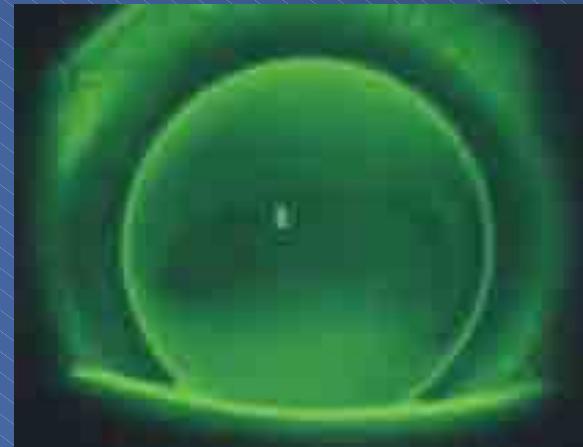
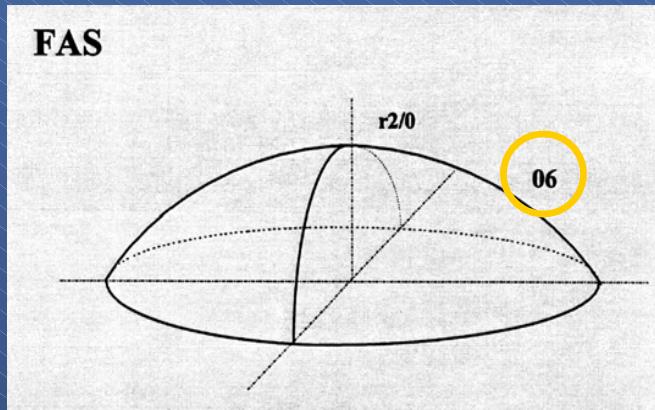
Toric Fit

Alignment toric Fit = Toric aspheric RGP, (2/3 rule)  
 BC 8.15 / 7,70 mm      nE. 0,4



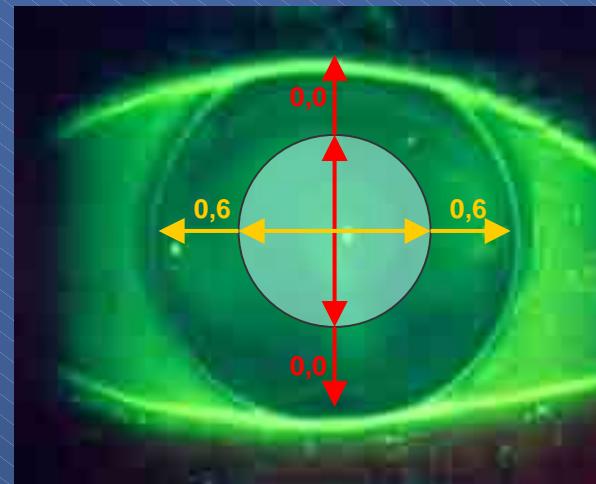
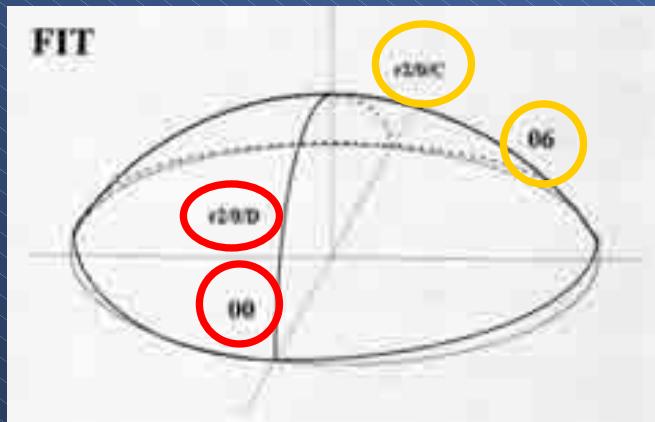
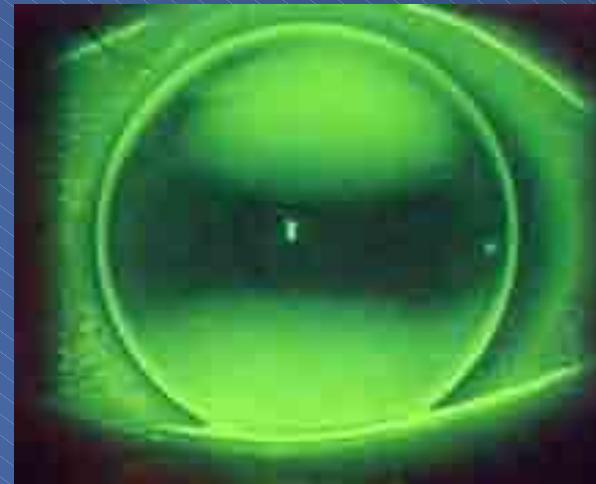
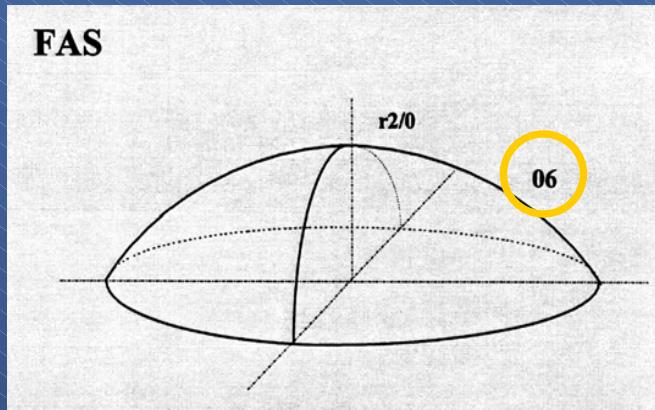
# Toric designs

Sphero-toric Design (> 1,5 but <2,5 cyl)



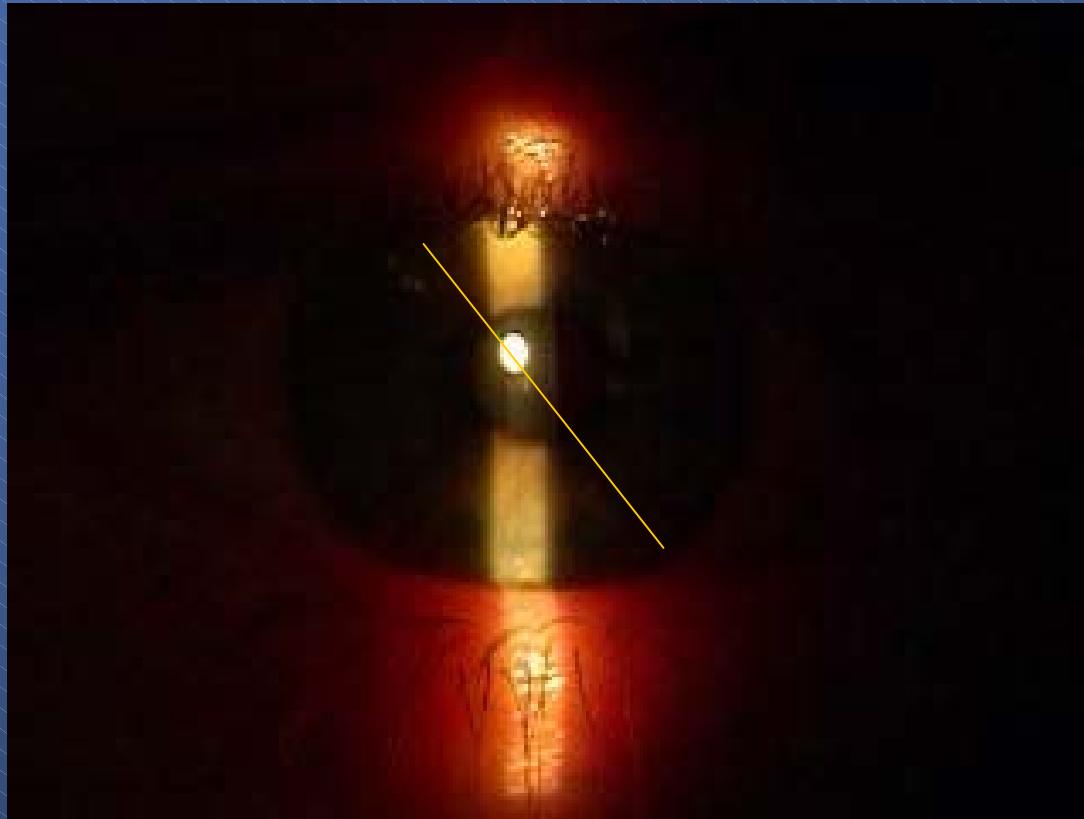
# Toric designs

## Backtoric Design (> 2,5 cyl)



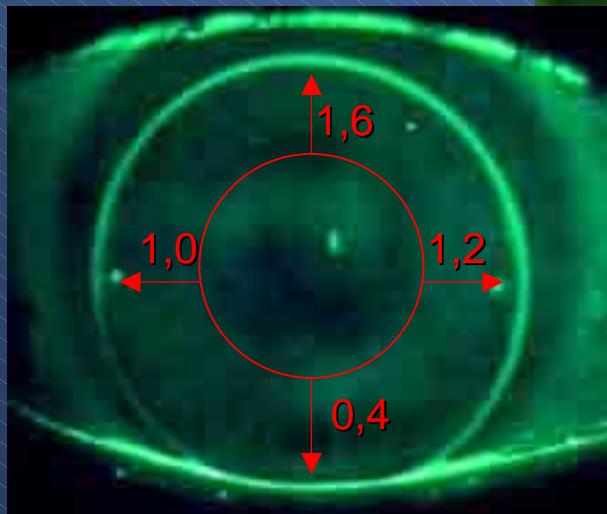
# Toric designs

Centration and movement (Astigmatismus obliquus)



# Irregular toric designs (prolat)

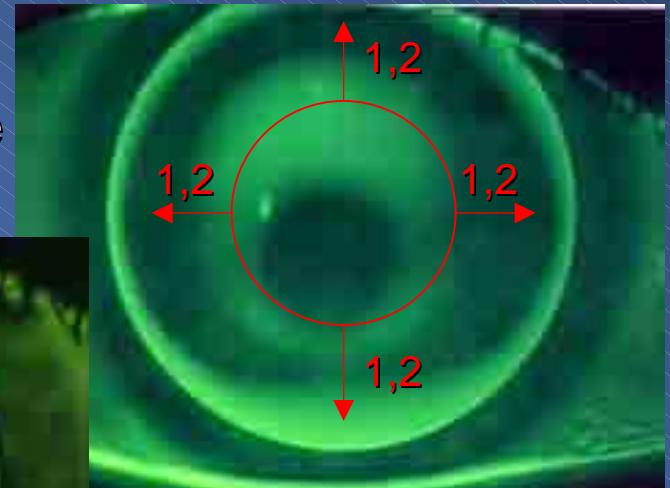
Alignment Fit  
(Quadrant-specific  
design)



First apical clearance  
(multicurve design)

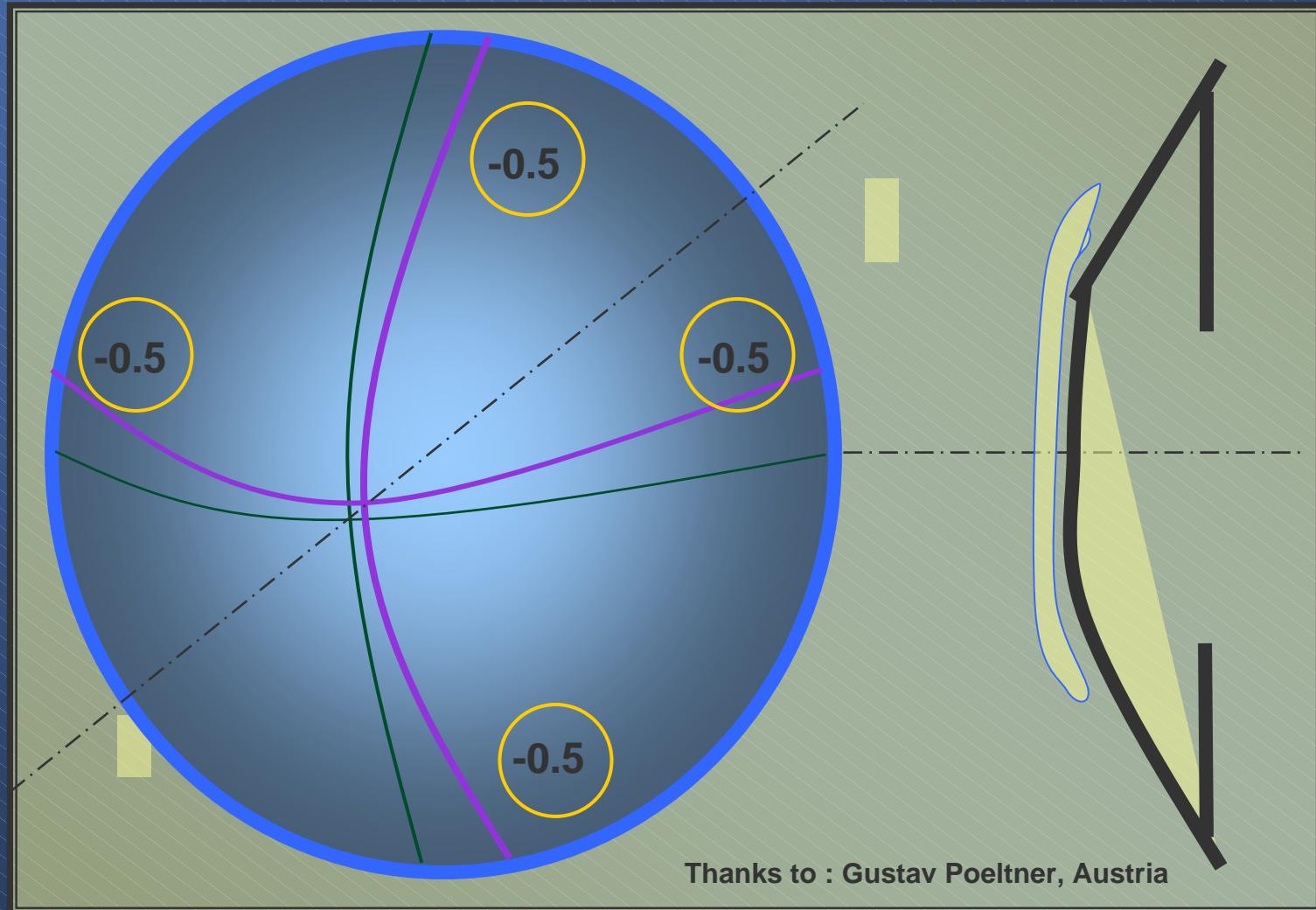


3-point Fit (multicurve or  
high aspheric design)



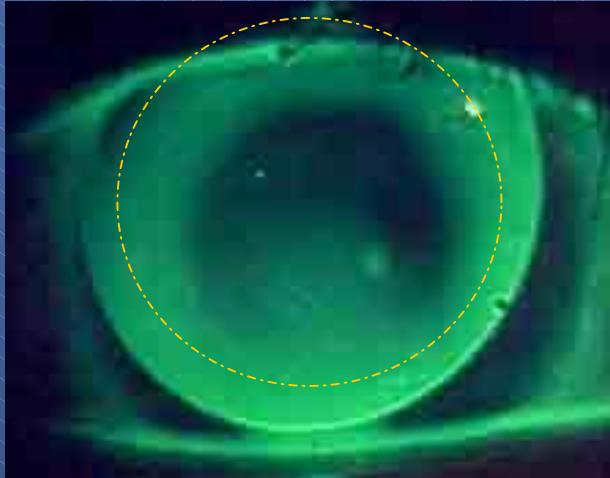
# Irregular toric designs (oblat)

post-PRK, post-LASIK, post-Keratoplasty

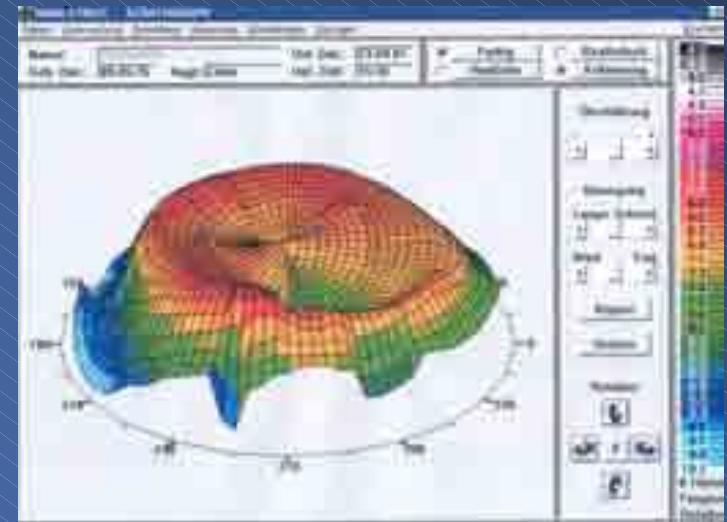


# Irregular toric designs

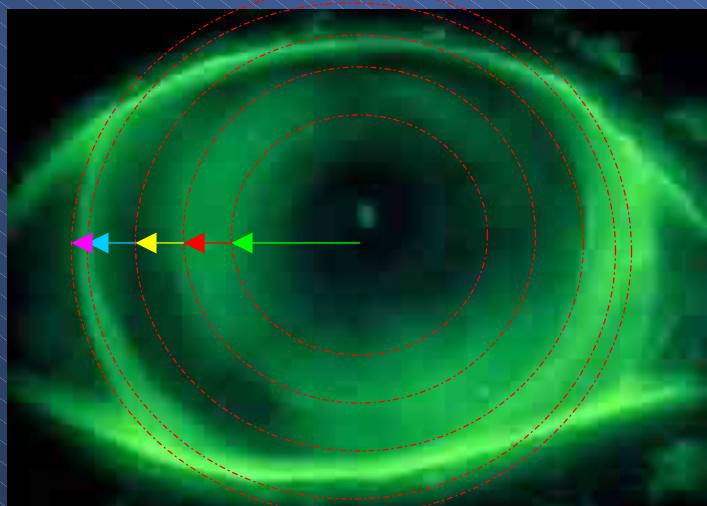
Monocurve CL (nE 0,0)



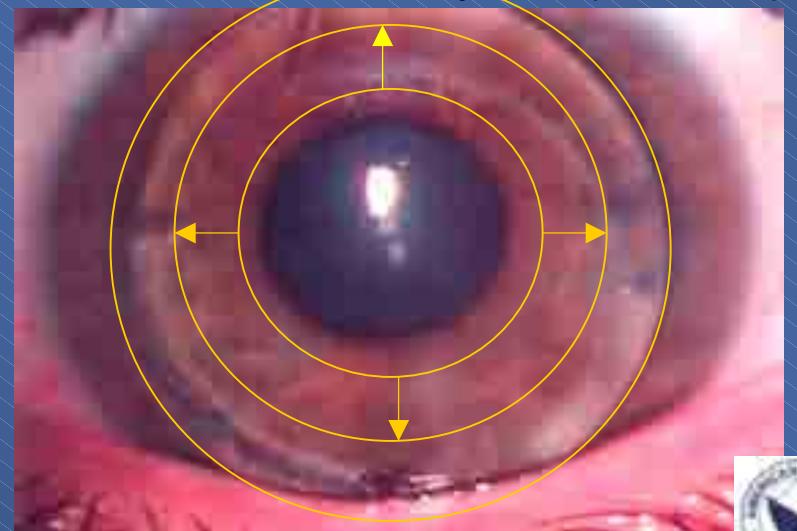
Astigmatic KP,  
steep edges



Miniscleral CL (reverse Geometry)



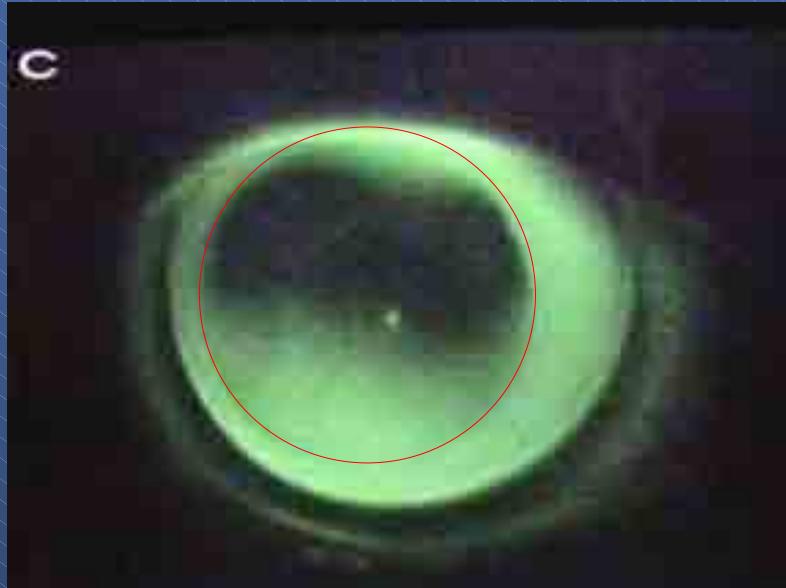
Reverse Geometry CL (nE -0,6)



# Irregular toric designs

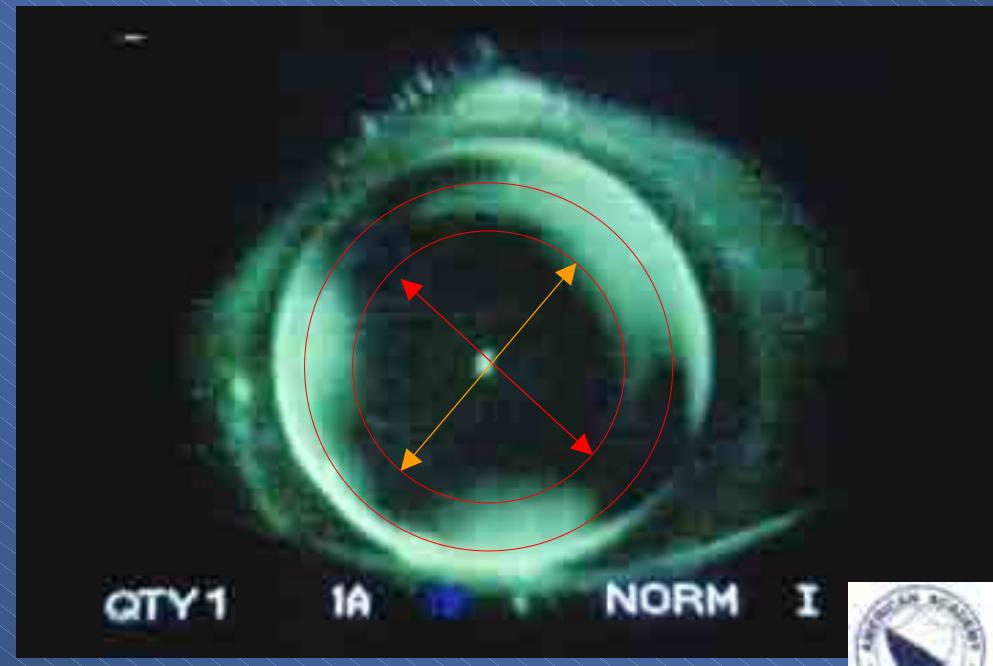
Monocurve CL (nE 0,0)

8,40 mm



Reverse Backtoric Geometry CL (nE -0,6)

8,40 / 7,60 mm



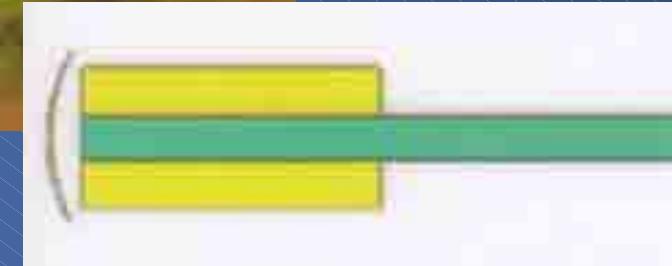
# Presbyopia Fits

Simultanious Design

Bi- or multifocal,  
aspheric, aplanatic :

-> Centration !

-> larger OAD  
(10,0 to 11,2 mm)

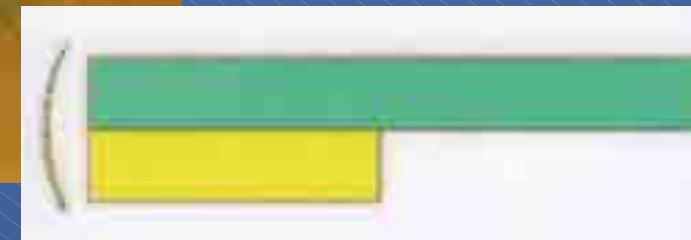
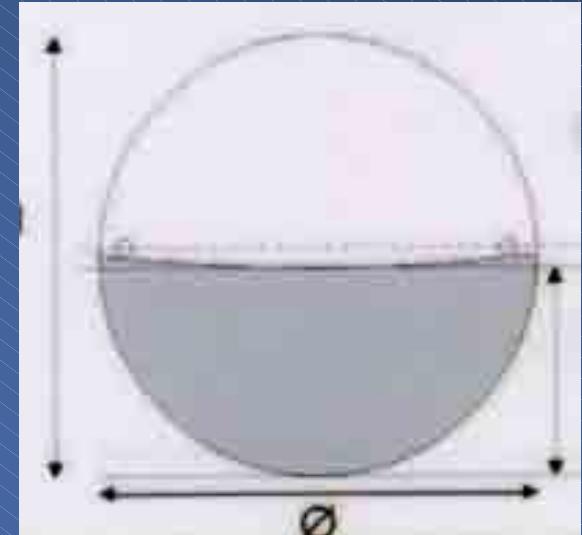


# Presbyopia Fits

Translating Design Bifocal :

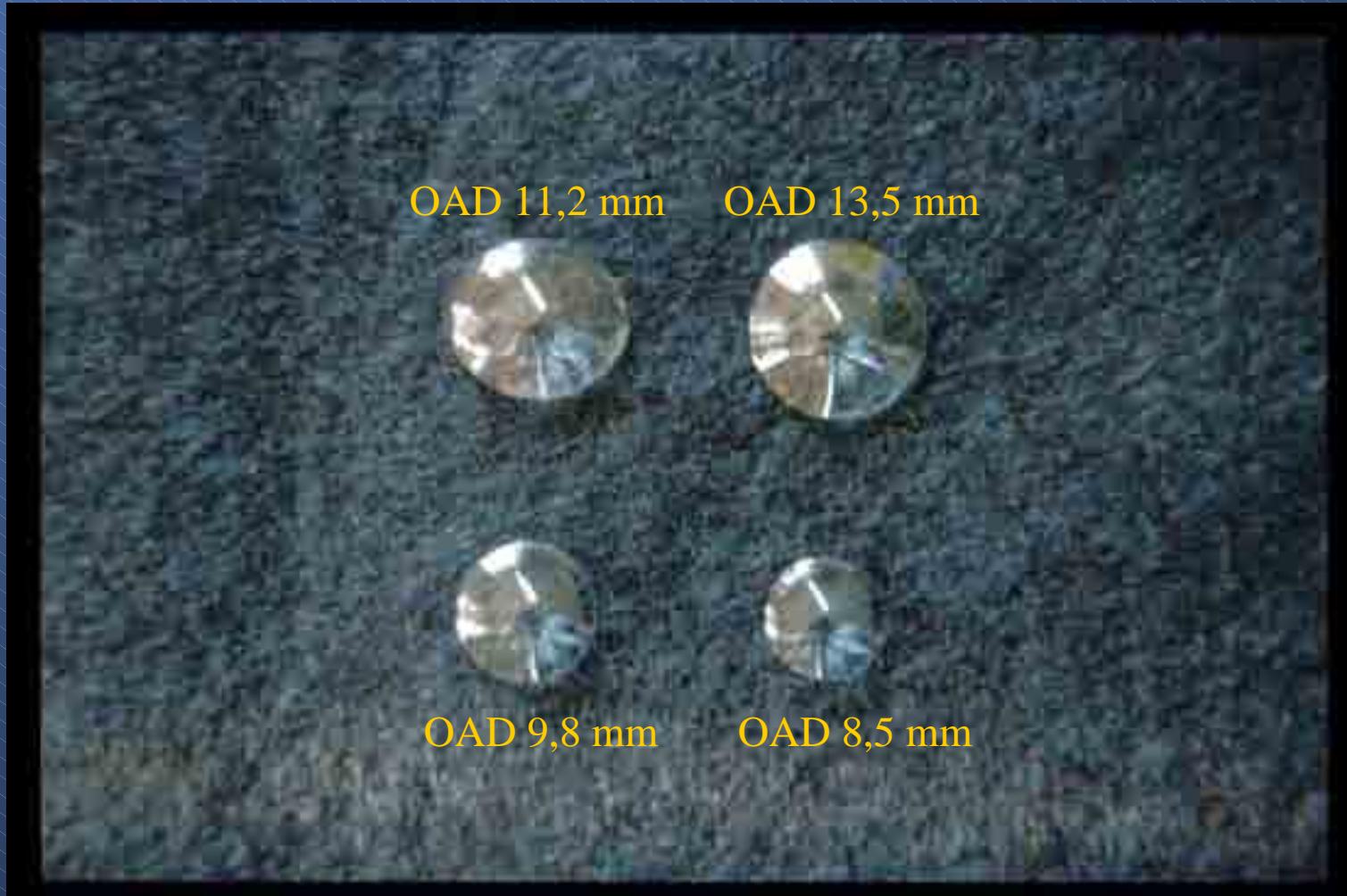
-> Movement !

-> smaller OAD (9,0 to 9,6 mm)



# Fitting technology

Small and large lenses



# Fitting technology

Small lenses :  
Tear exchange  
Oxygen  
Movement



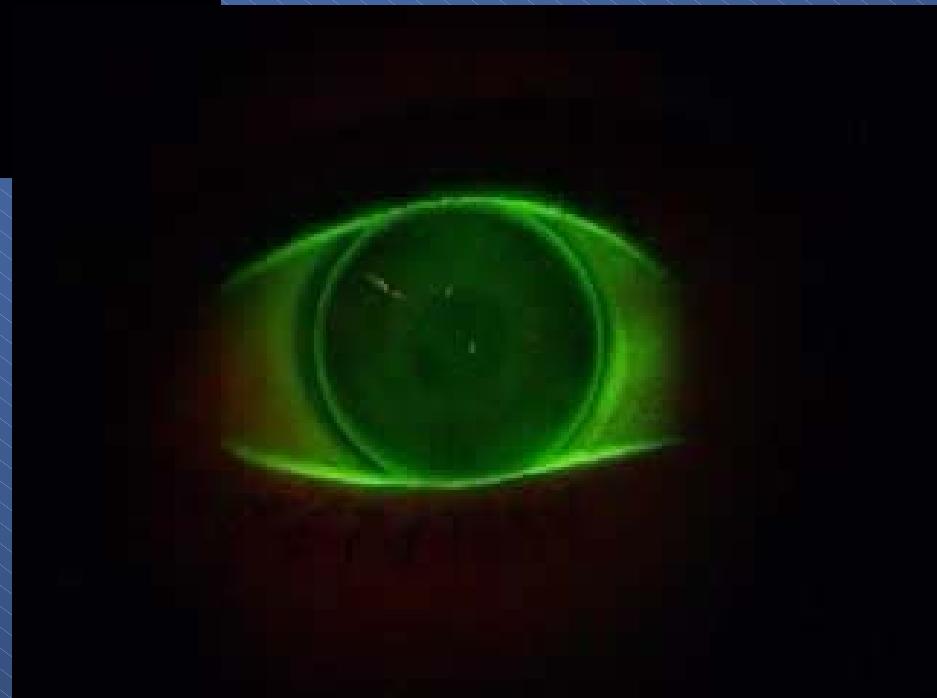
Large lenses (intra-limbal):  
Comfort  
Stabilization  
Safety  
Less dust  
Handling



# Fitting technology

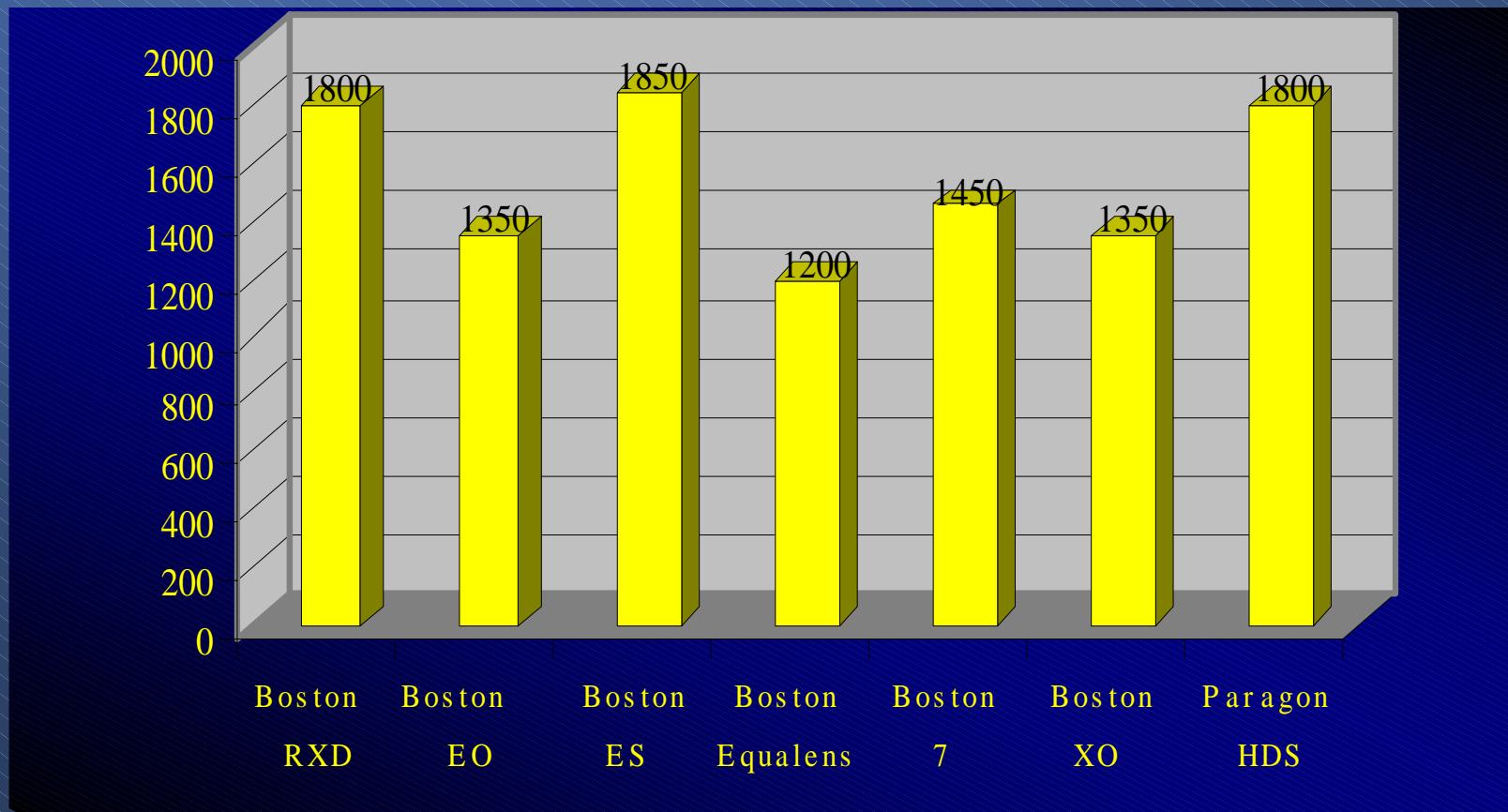


Lens size :  
Tear exchange  
Oxygen  
Movement



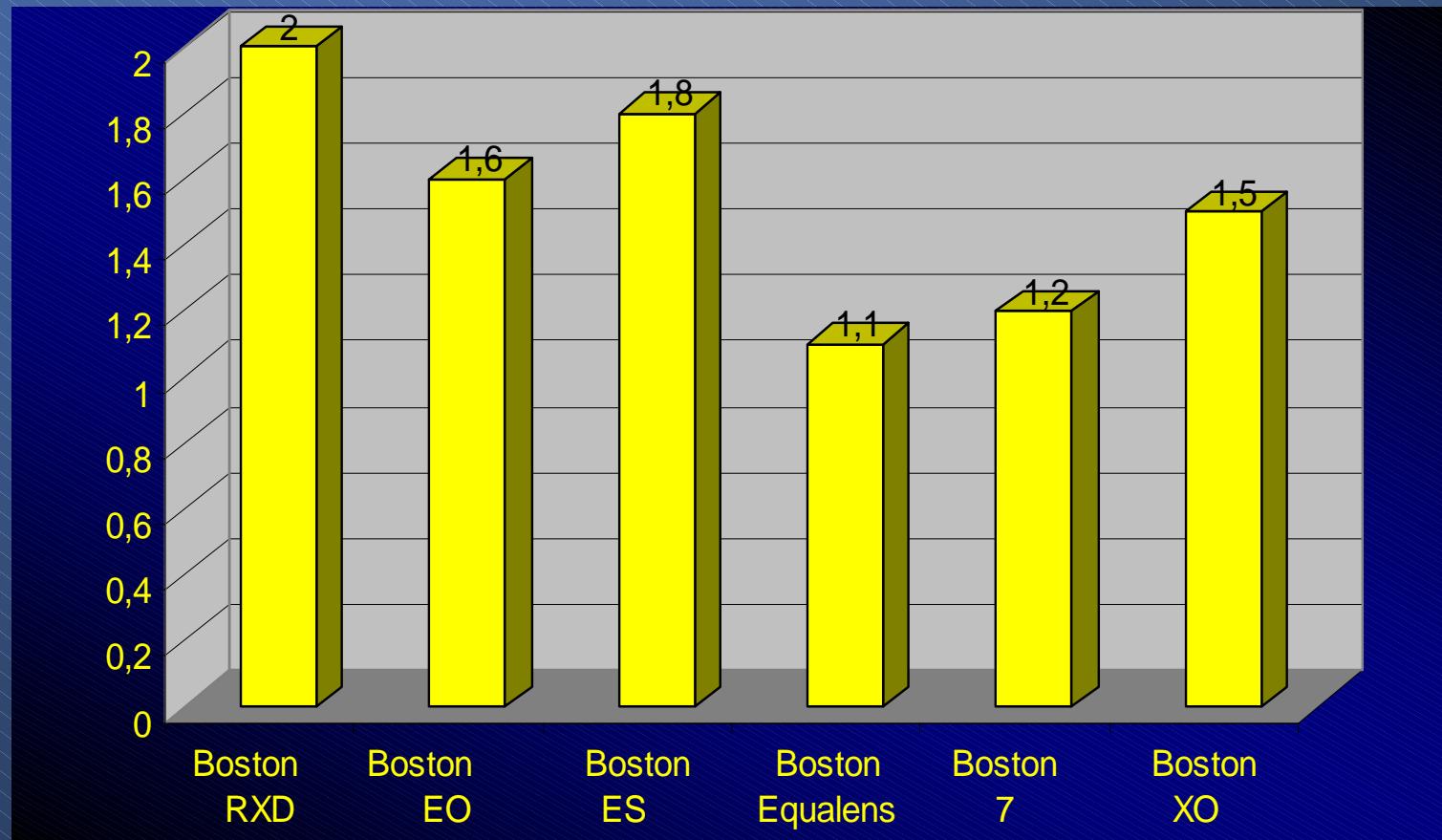
# Fitting technology

Flexural Modulus,  
one factor for on-eye stability



# Fitting technology

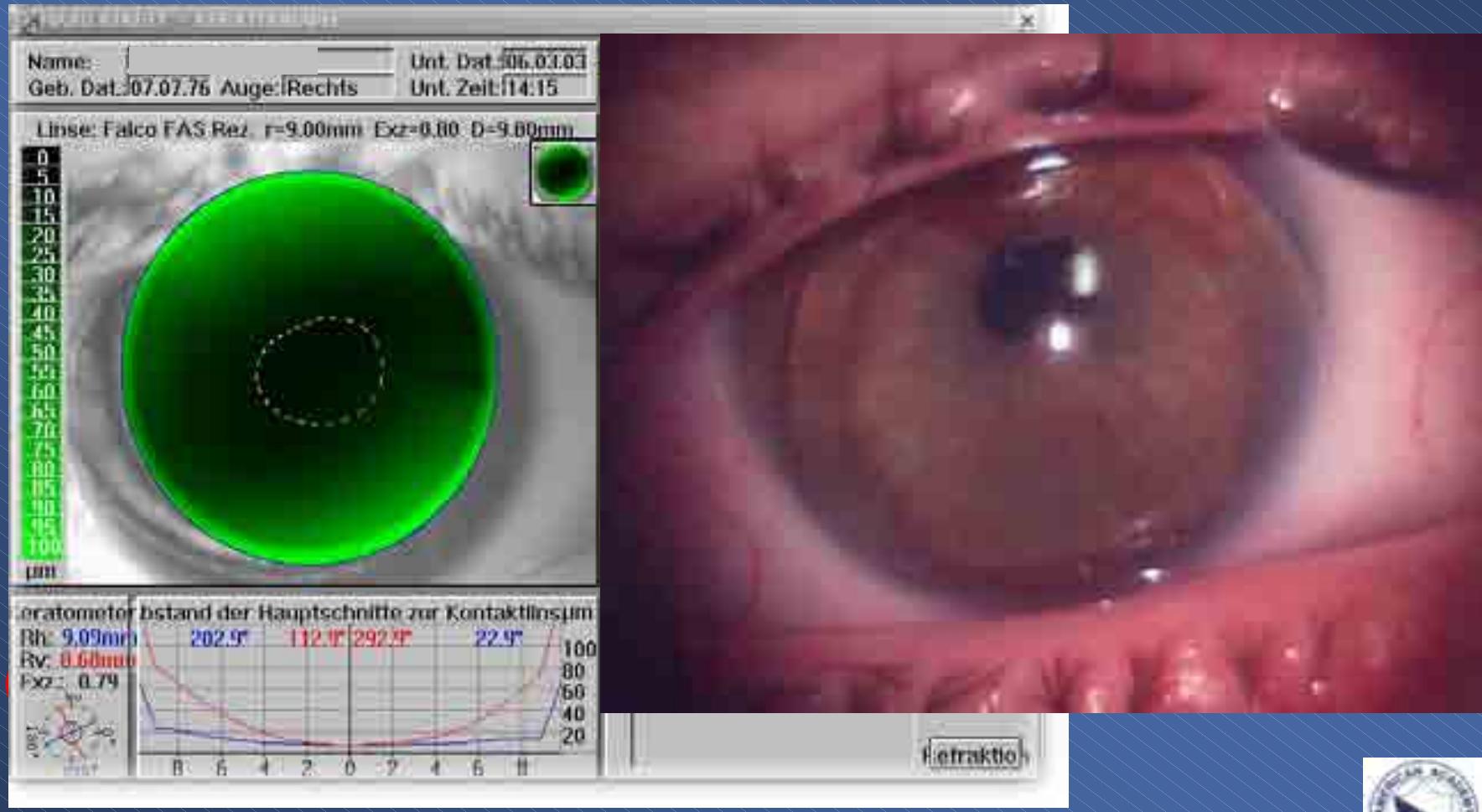
Toughness,  
a second factor for long term stability



# Case # 1 Dislocated CL

Marfan Syndrom (aphakic)

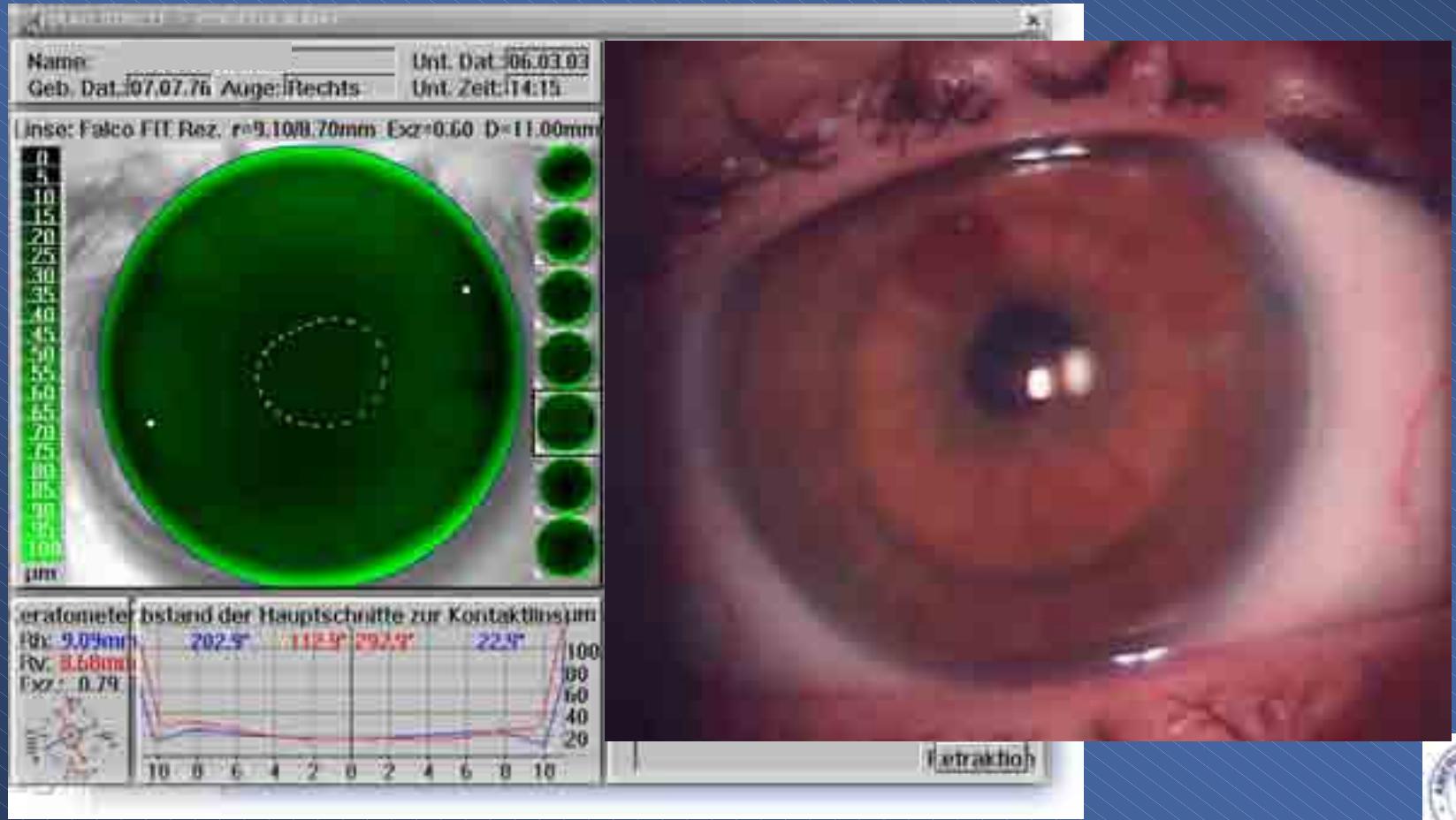
Standart aspheric lens n.E. 0,8 BC 9,00 + 17,5 dpt



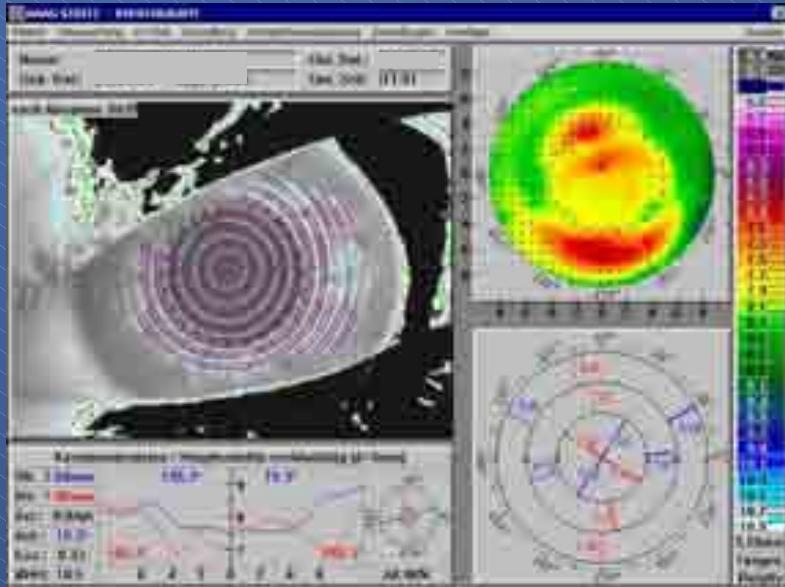
# Case # 1 Dislocated CL

Multifocal, backtoric lens

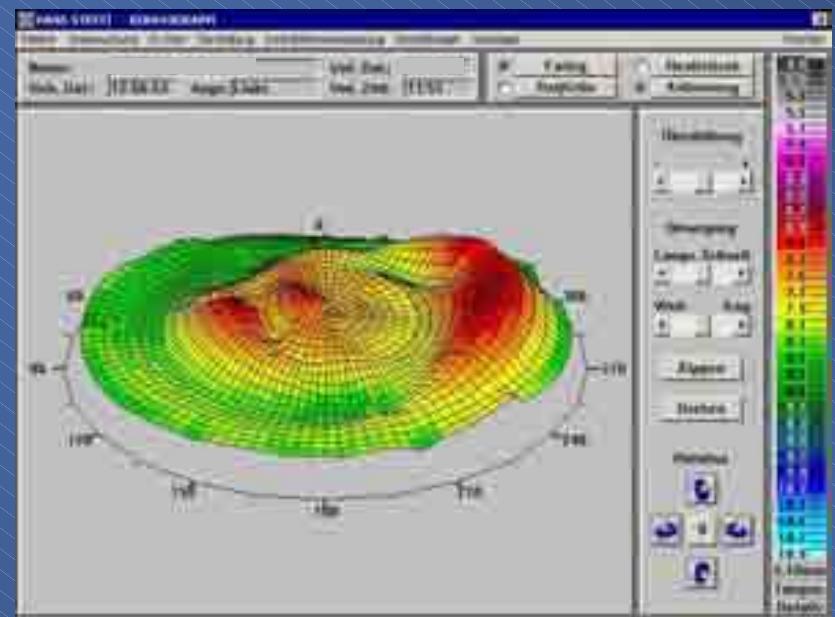
FITmulti n.E. 0,6 BC 9,10/8,70 + 17,5 11,20mm Add. 3,0 NM 2,25mm



# Case # 2 Warpage cornea

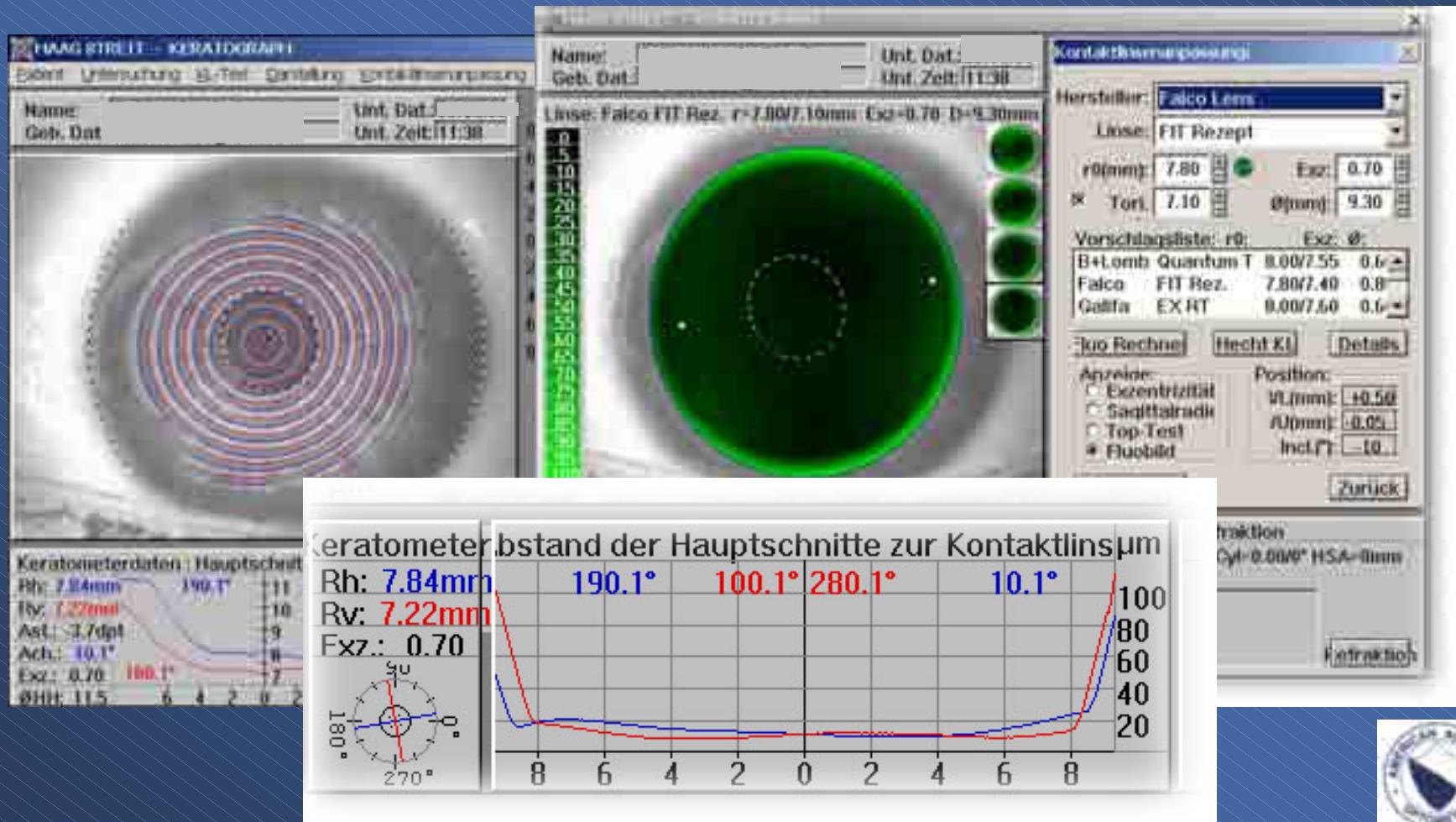


Refractive changes and  
spectacle blur



# Case # 2 Warpage cornea

New Fit after 2 weeks w/o CL



# Case # 3 Sticking lens

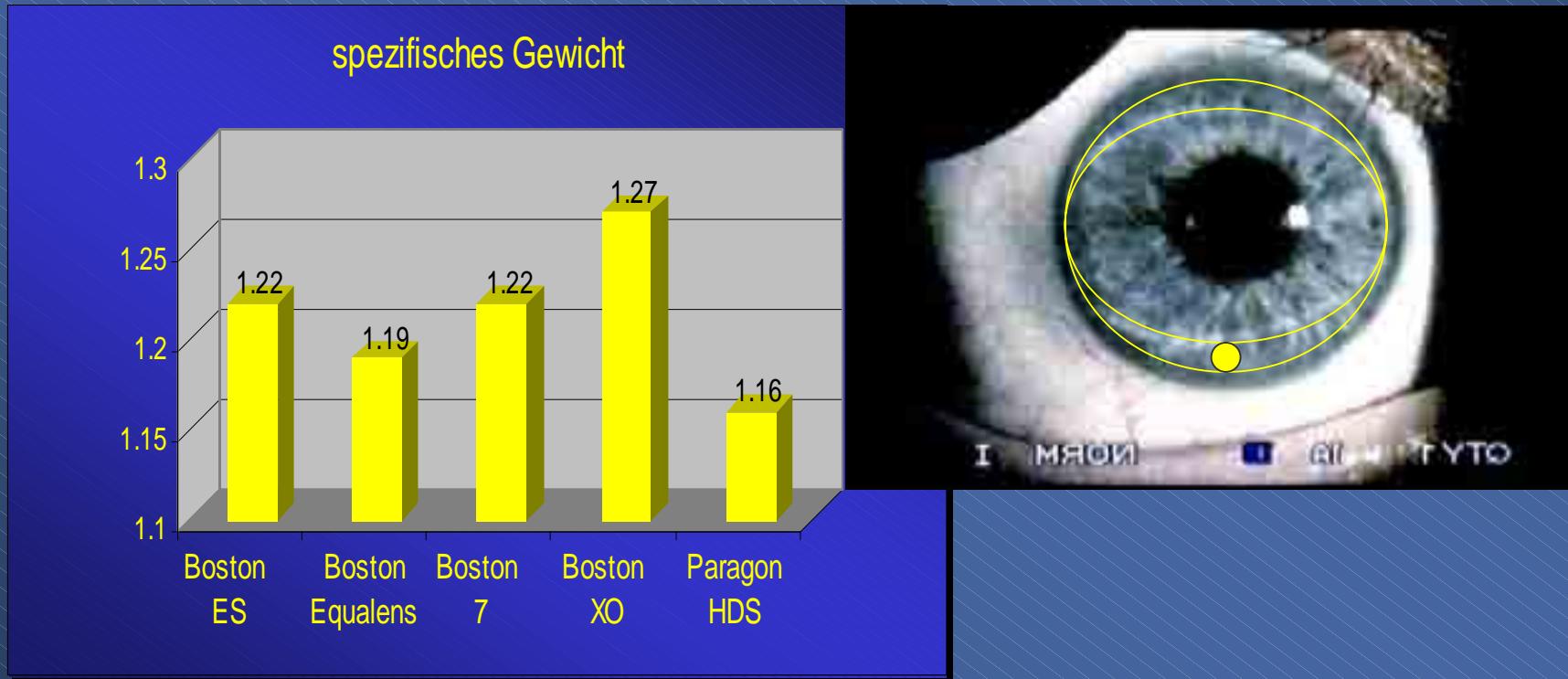
Mucin deposits caused  
by a high riding CL



# Case # 3 Sticking lens

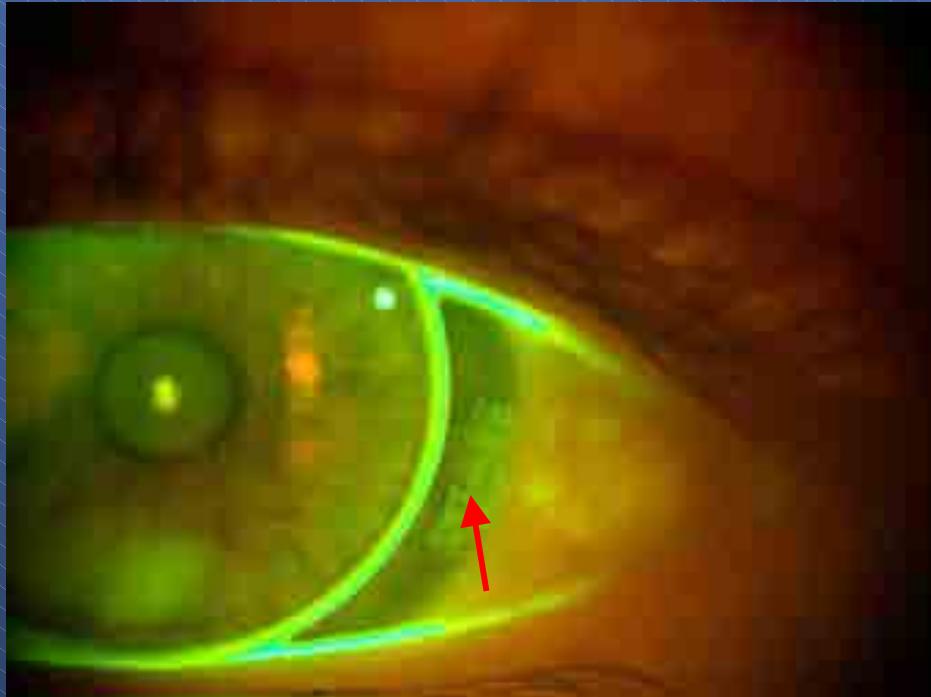
High specific weight (Boston > Paragon)

Prismatic ballast and oval shape



# Case # 4 3/9 Staining

Old, but ongoing problem



Pure corneal staining

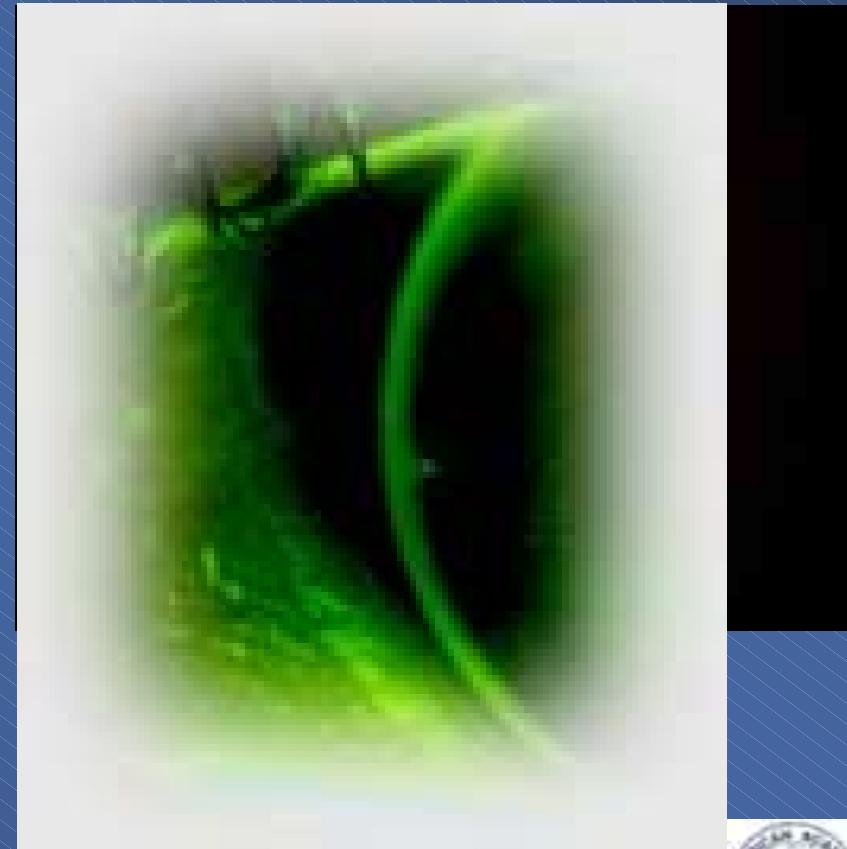


Corneal staining with limbal / conjunctival involvement



# Case # 4 3/9 Staining

## Increasing the Bevel (?)



# Case # 4 3/9 Staining

Smaller (thinner) or larger (covering) ?



# Case # 4 3/9 Staining

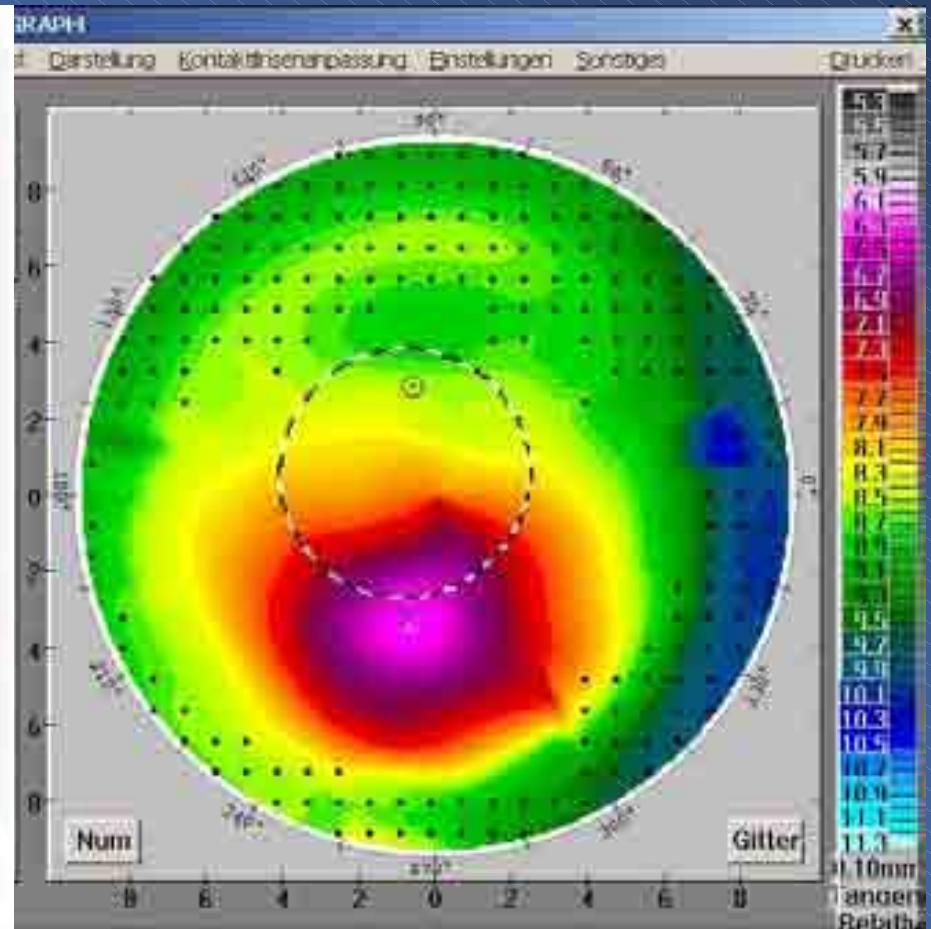
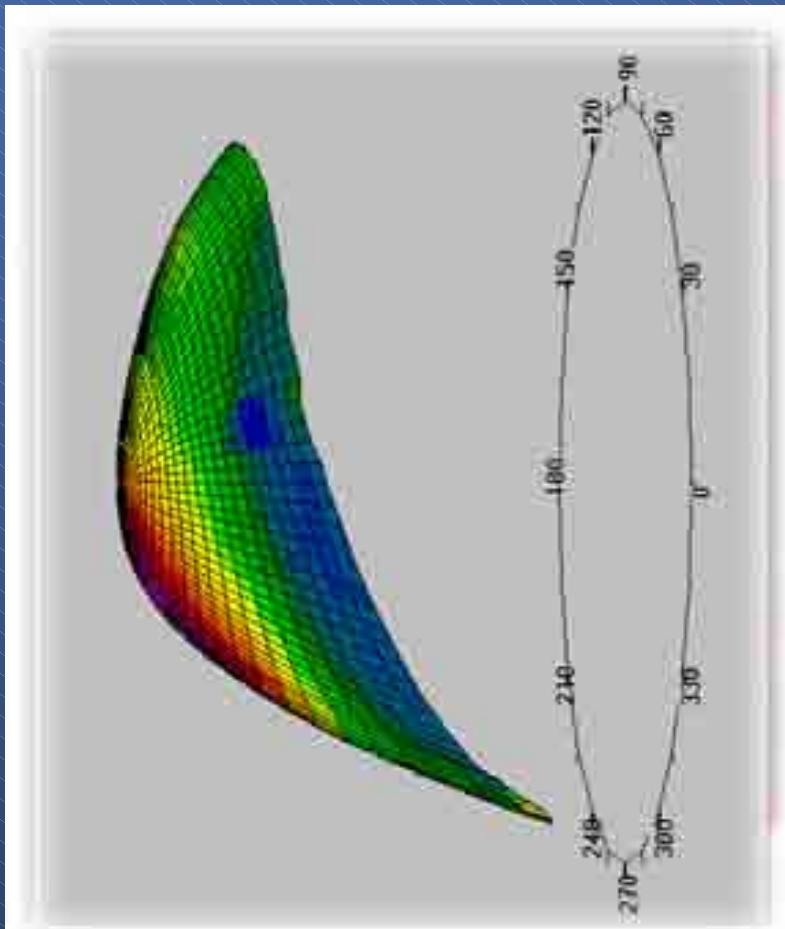
Personal experience :

- ✓ Fight pure corneal staining by covering.
- ✓ Fight corneal staining with limbal / conjunctival involvement by large Miniscleral RGP or soft contact lenses.

**GOOD LUCK !**



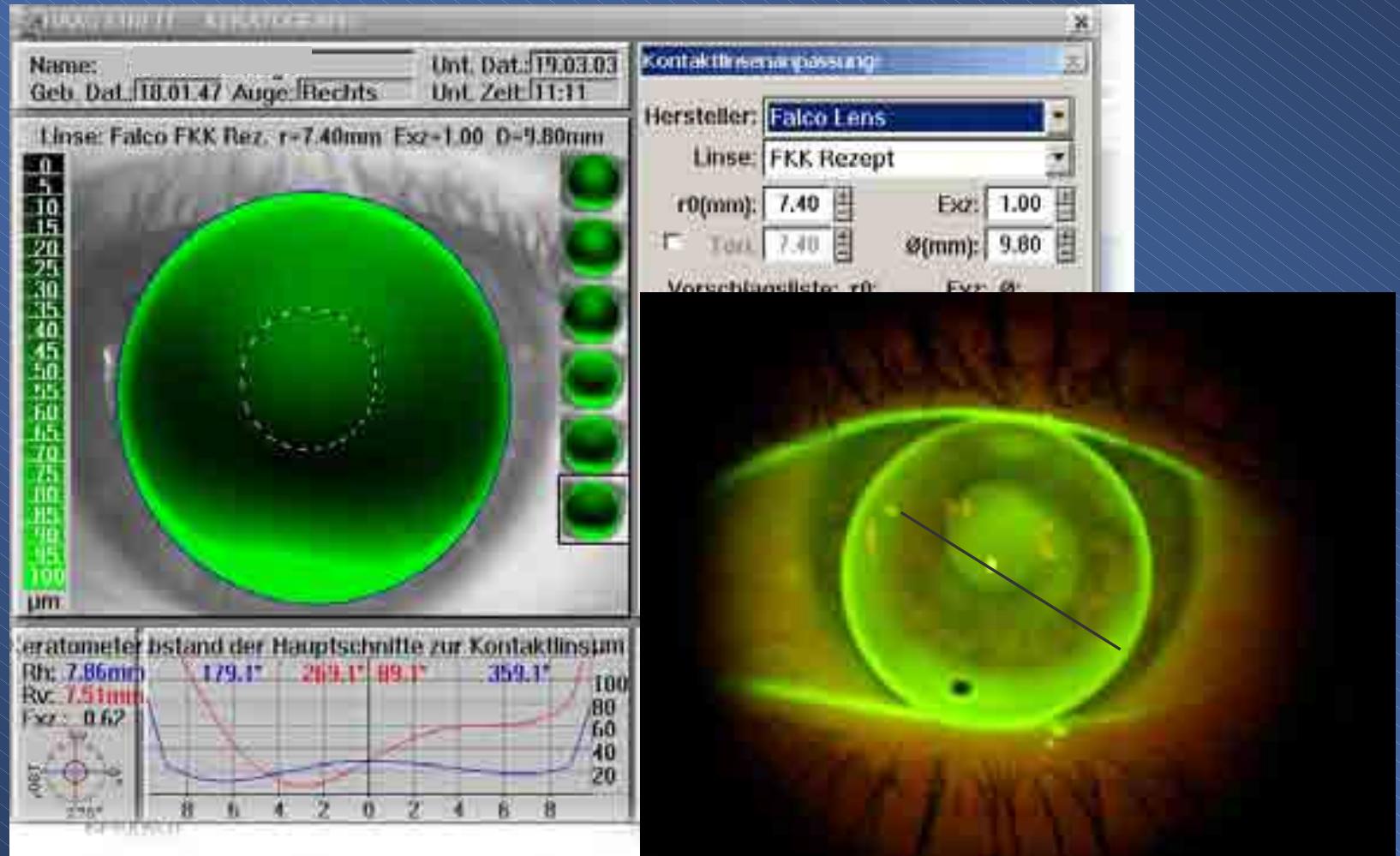
# Case # 5 Presbyopia CL



Bifocal Bi-toric lens (Keratoconus Amsler 2)



# Case # 5 Presbyopia CL



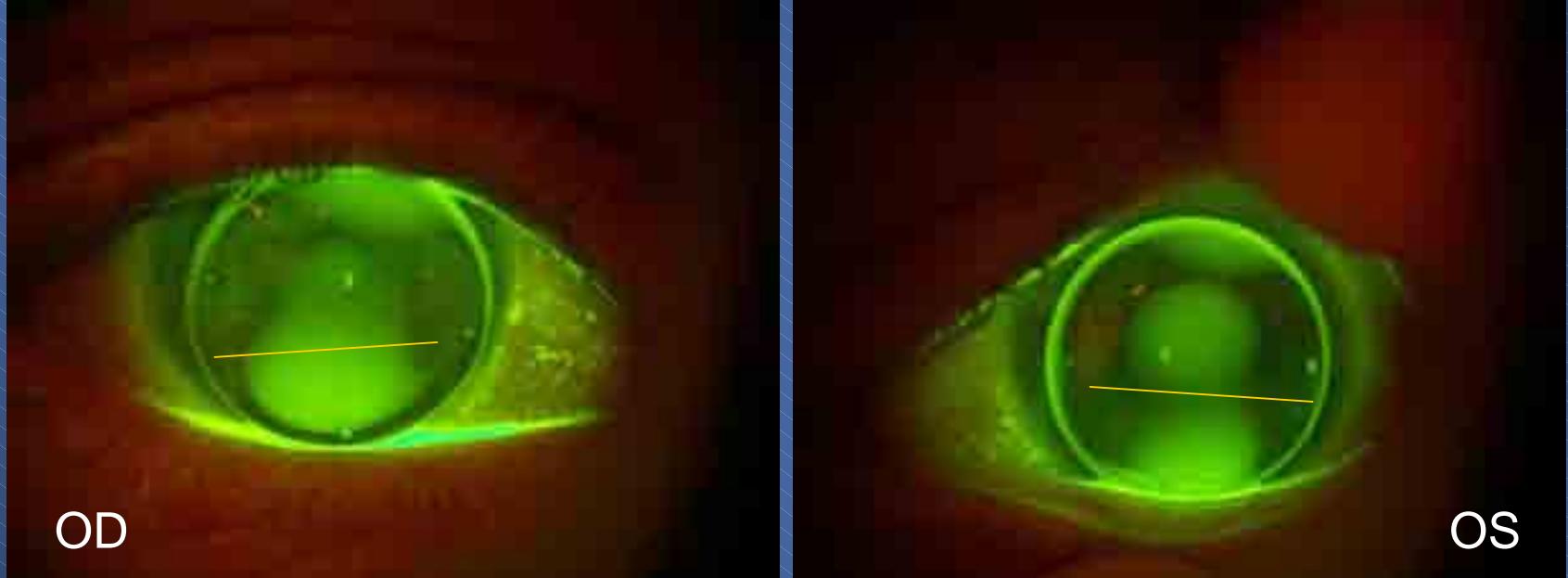
# Case # 5 Presbyopia CL



Incline the Seg by 20° counter clockwise

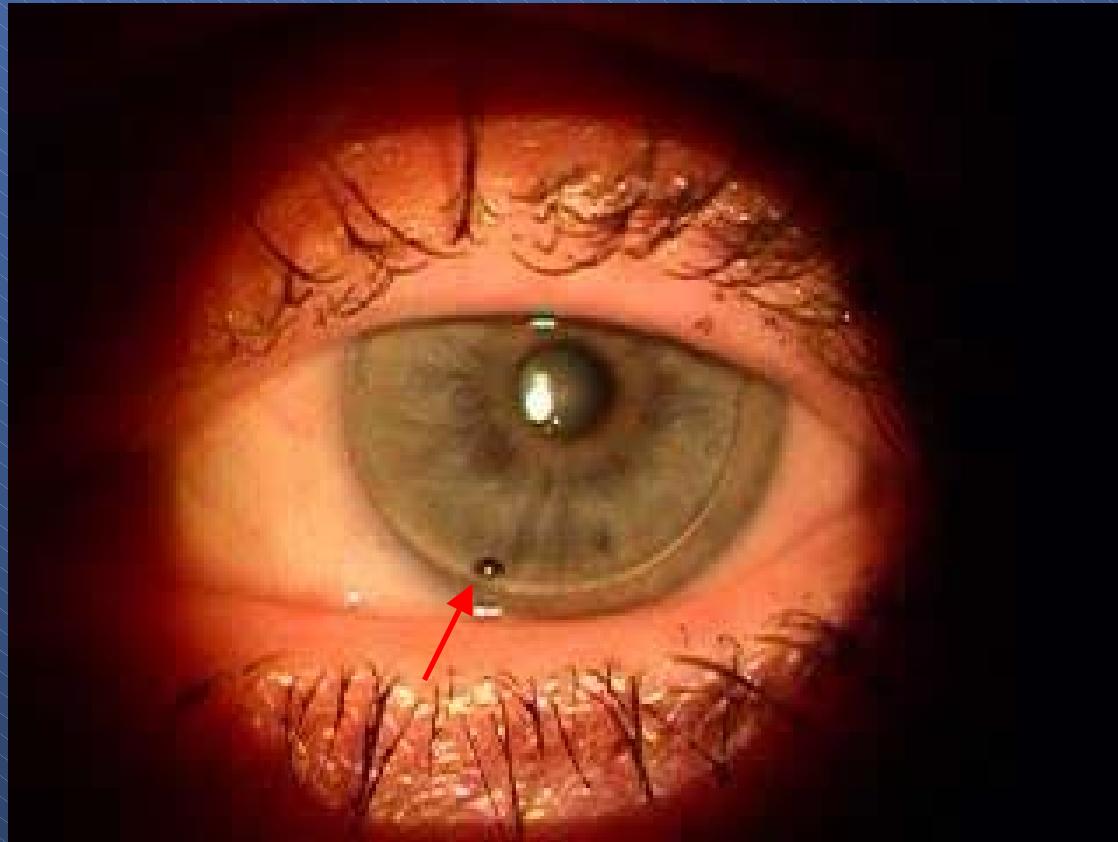


# Case # 5 Presbyopia CL



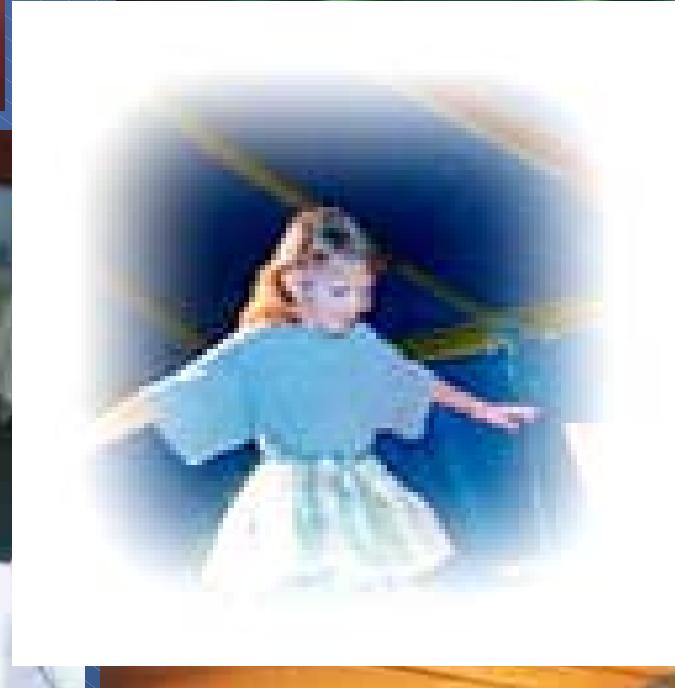
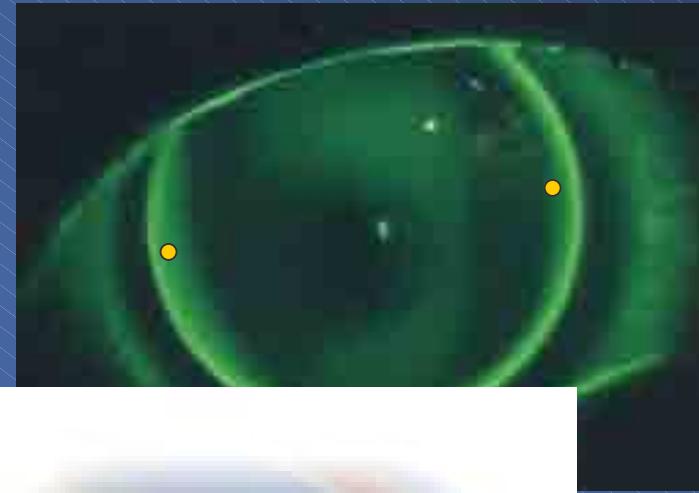
# Case # 5 Presbyopia CL

Translating Design Bifocal :  
-> Movement and Centration !



# Case # 6 Aphakia and Children

Backtoric Bi-, Tri- or Multifocal RGP



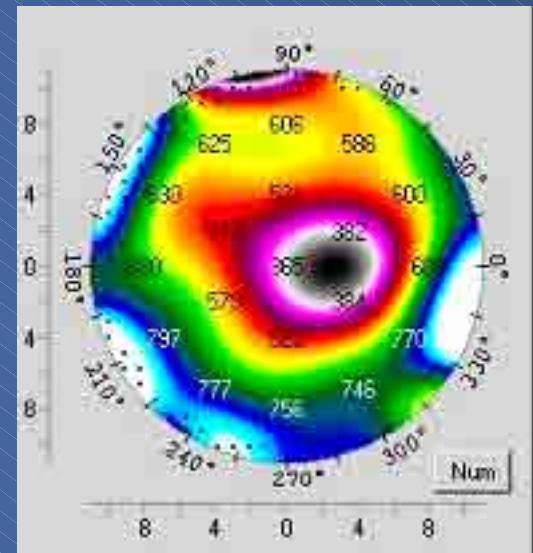
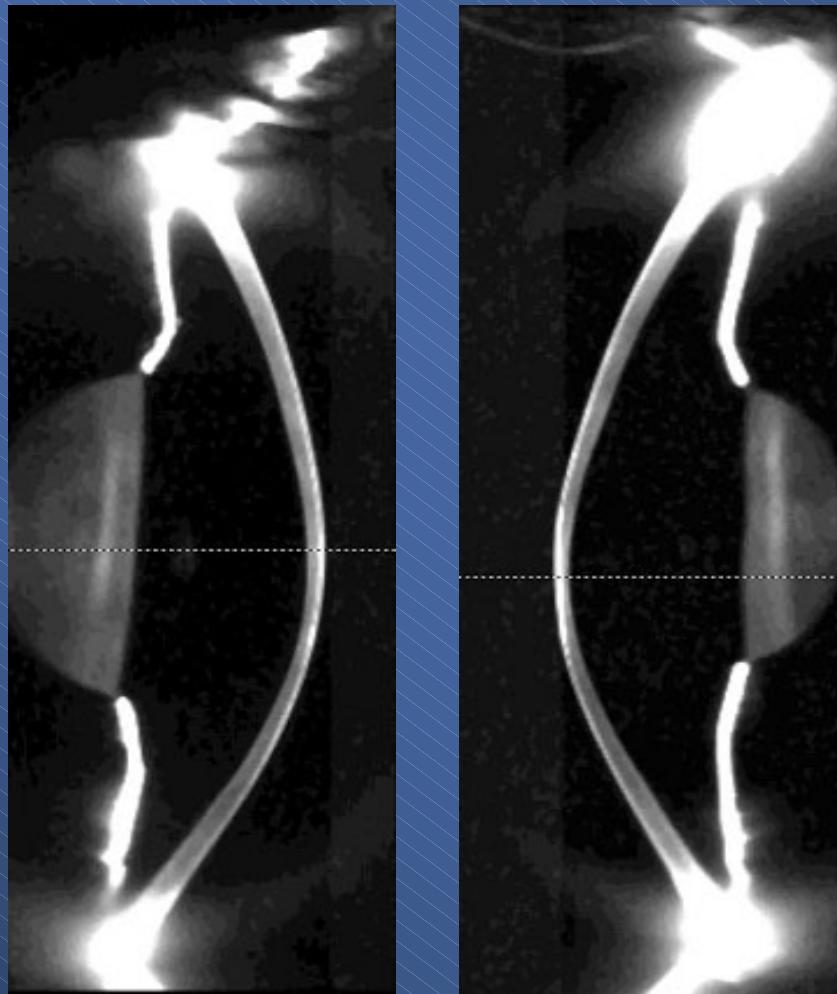
# If everything would be so easy !



# Short Break



# Case # 7 Keratoconus

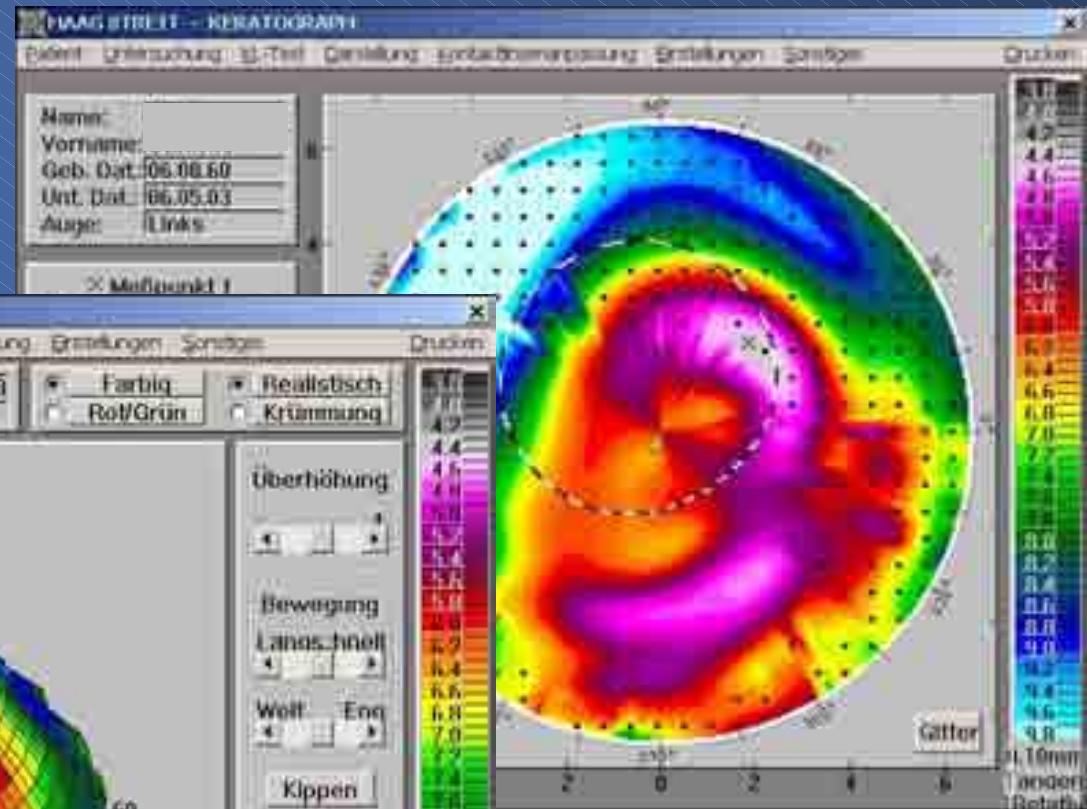
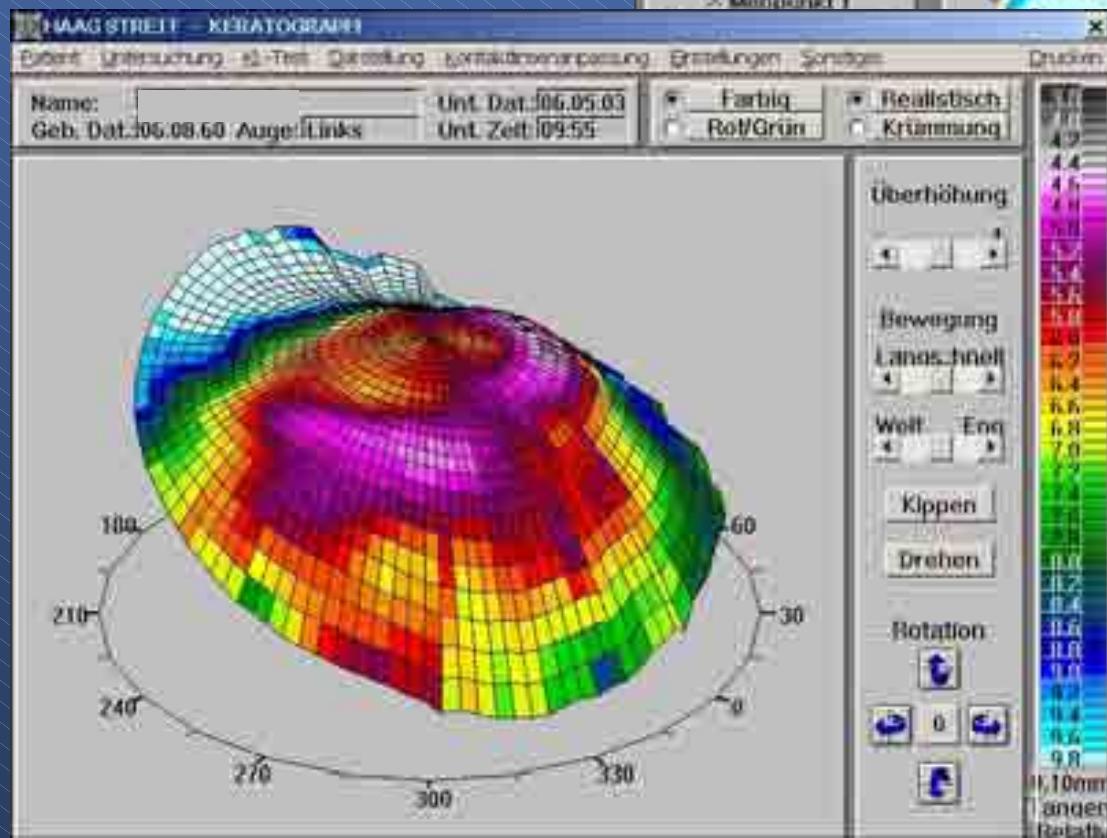


Photos by Dr. E. Bürki / Thun , Pentacam



# Case # 7 Keratoconus

e.g. Amsler 4 +



# Case # 7 Keratoconus

„Our working hypothesis for keratoconus is, that multiple factors like UVB, atopy, mechanical scratching of the eyes and unsufficient fitted CL, can cause either an oxidative damage, a damage of the cellular structure or disturbing the physiological cell function. If the cells are damaged irreversible, apoptosis follows. If the cells are only damaged reversibly, the cells undergo wound healing thru upregulated degradative enzymes and wound healing factors, which leads to focal areas of corneal thinning and fibrosis.“ \* (\*Translated from the german article by Michael Baertschi)

M. Cristina Kenney, MD, PhD, et al.

Ophthalmology Research Laboratories, Cedars-Sinai Medical Center, University of California : CLAO Journal Jan. 2000 / die kontaktlinse 10/2003

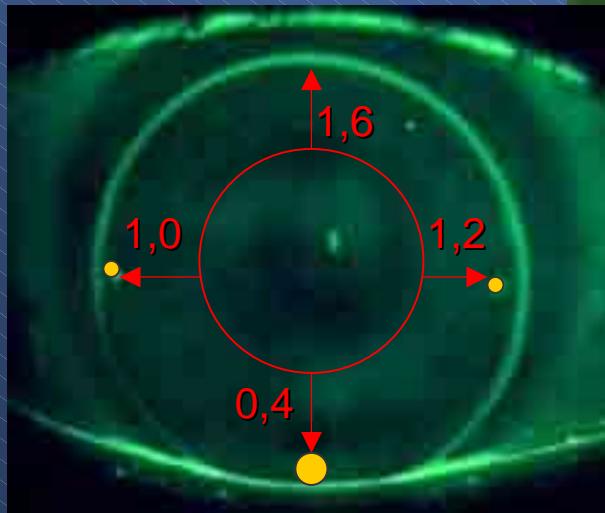
## New Keratoconus Lens on the Market

Accu Lens, Inc. just announced the availability of Eni-Eye Soft K, indicated for the treatment of keratoconus. The Eni-Eye Soft K has two fenestrations to allow a thicker-than-normal central zone. The thicker central zone creates a tear lens effect for improved visual acuity on an irregular cornea. The lens is manufactured by Soflex and is available in a three-lens diagnostic fitting system (7.3mm, 7.6mm, 7.9mm). For more information, call (800) 525-2470.

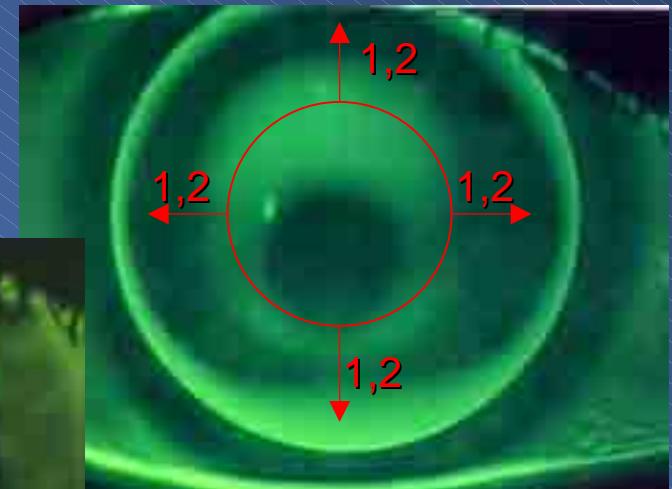


# Case # 7 Keratoconus

Alignment Fit  
(Quadrant-specific  
design)



First apical clearance  
(multicurve design)

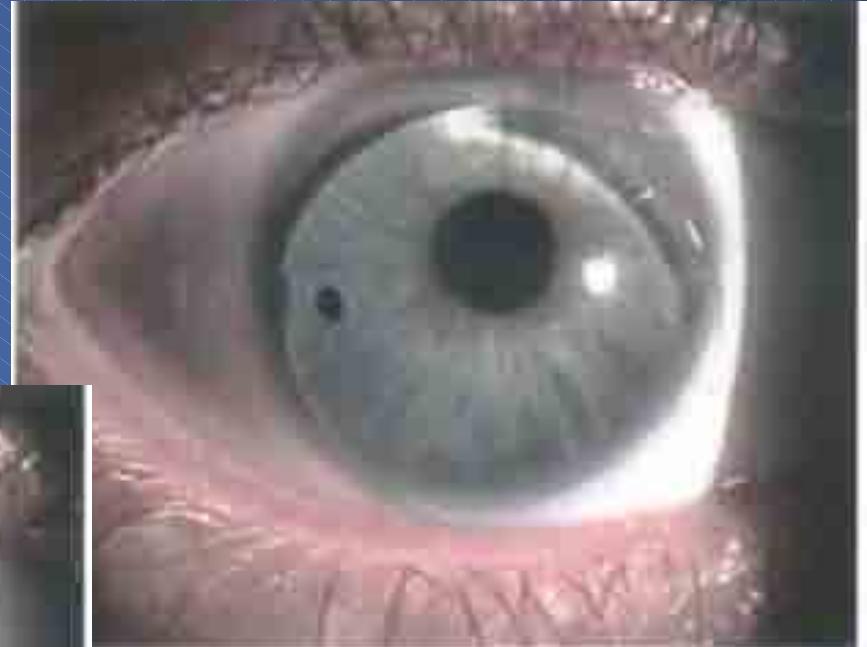
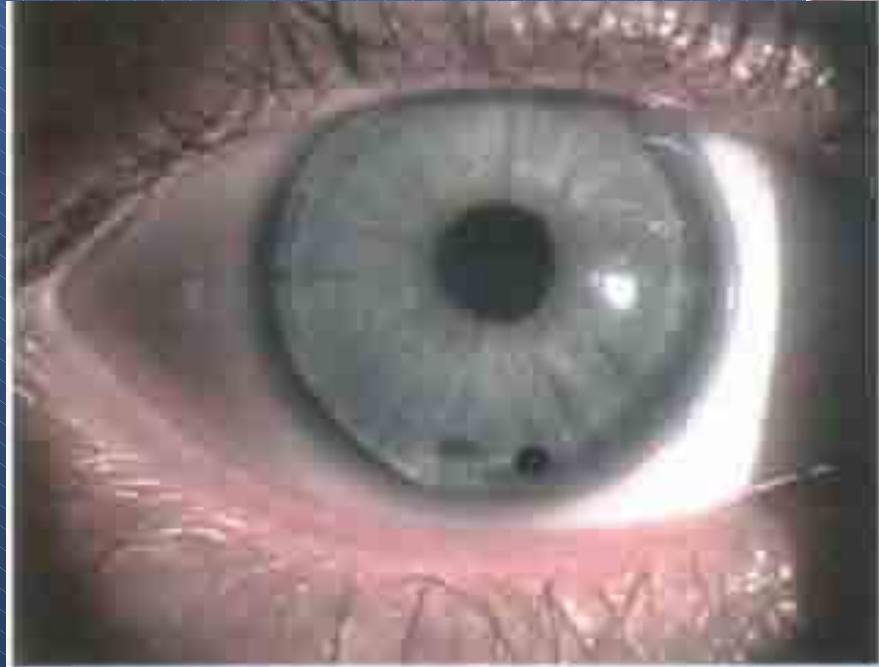


3-point Fit (multicurve or high  
aspheric design)

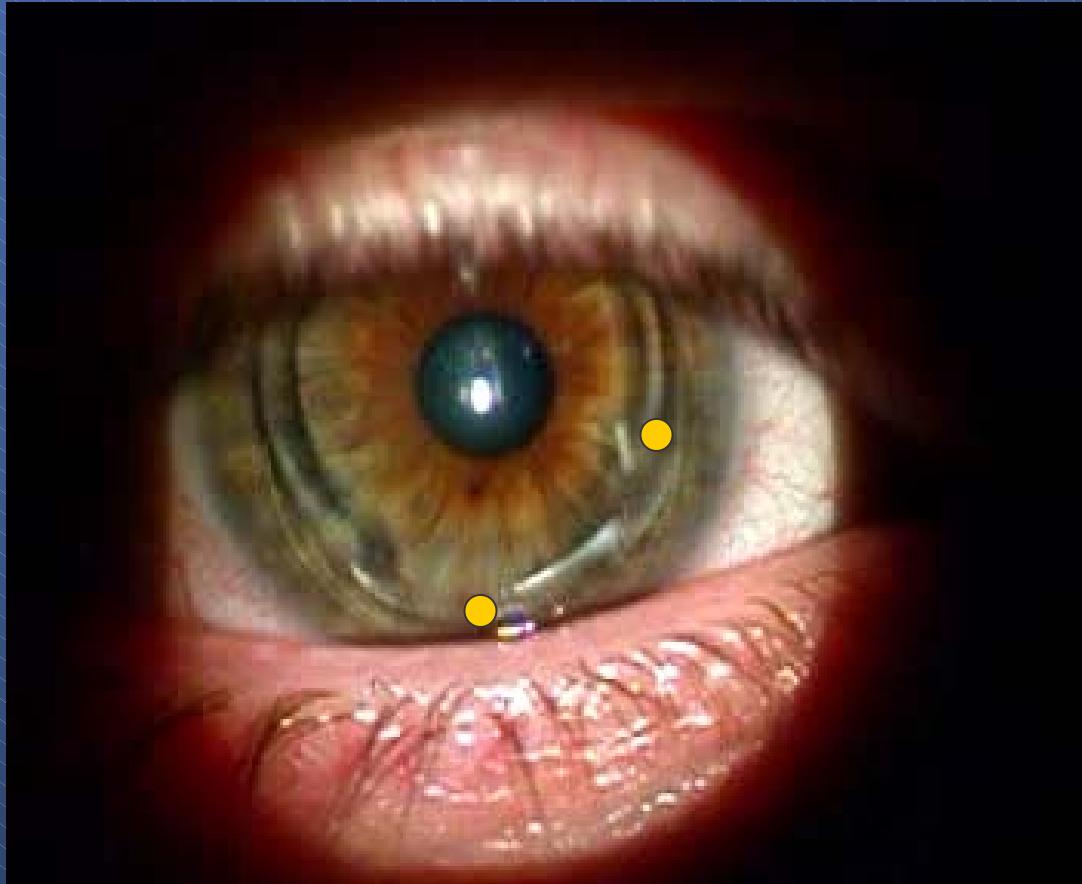


# Case # 7 Keratoconus

Stabilization !



# Case # 7 Keratoconus

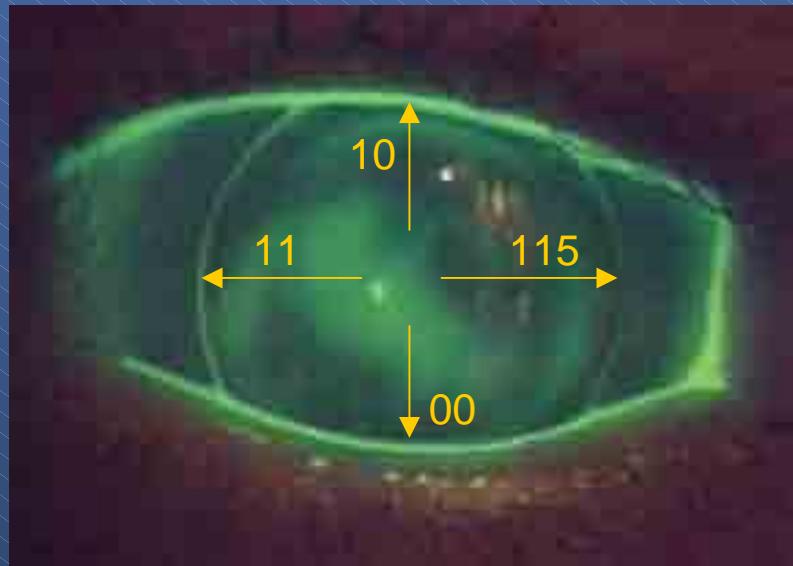


Stabilization !



# Case # 7 Keratoconus

e.g. Amsler 4+



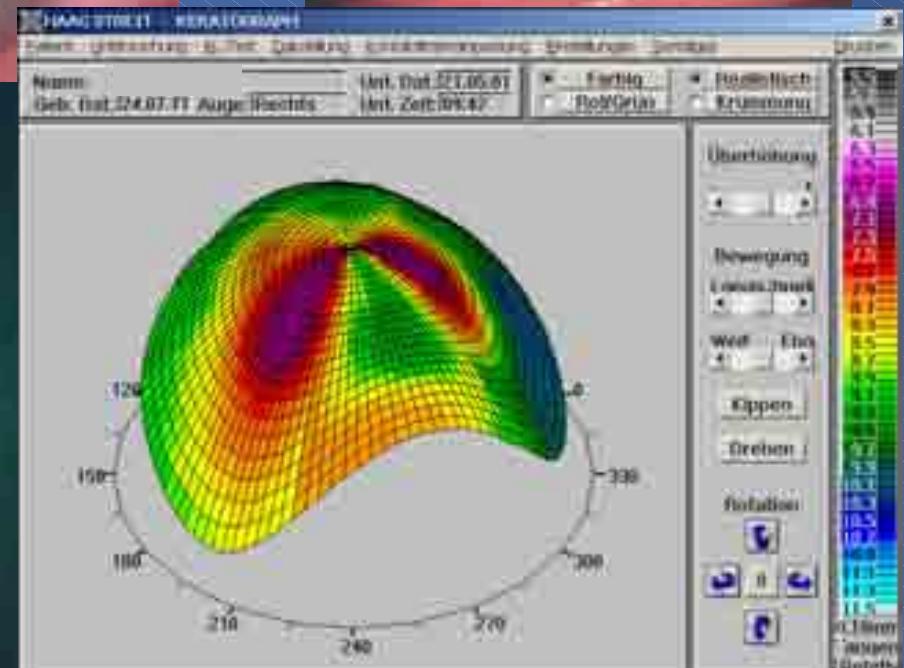
FKQT XO 1.1 / 1.15 / 1.0 / 0.0 5.40 -20.25 - 1.50 68° 9.6mm



# Case # 8 Pellucid marginal Degeneration

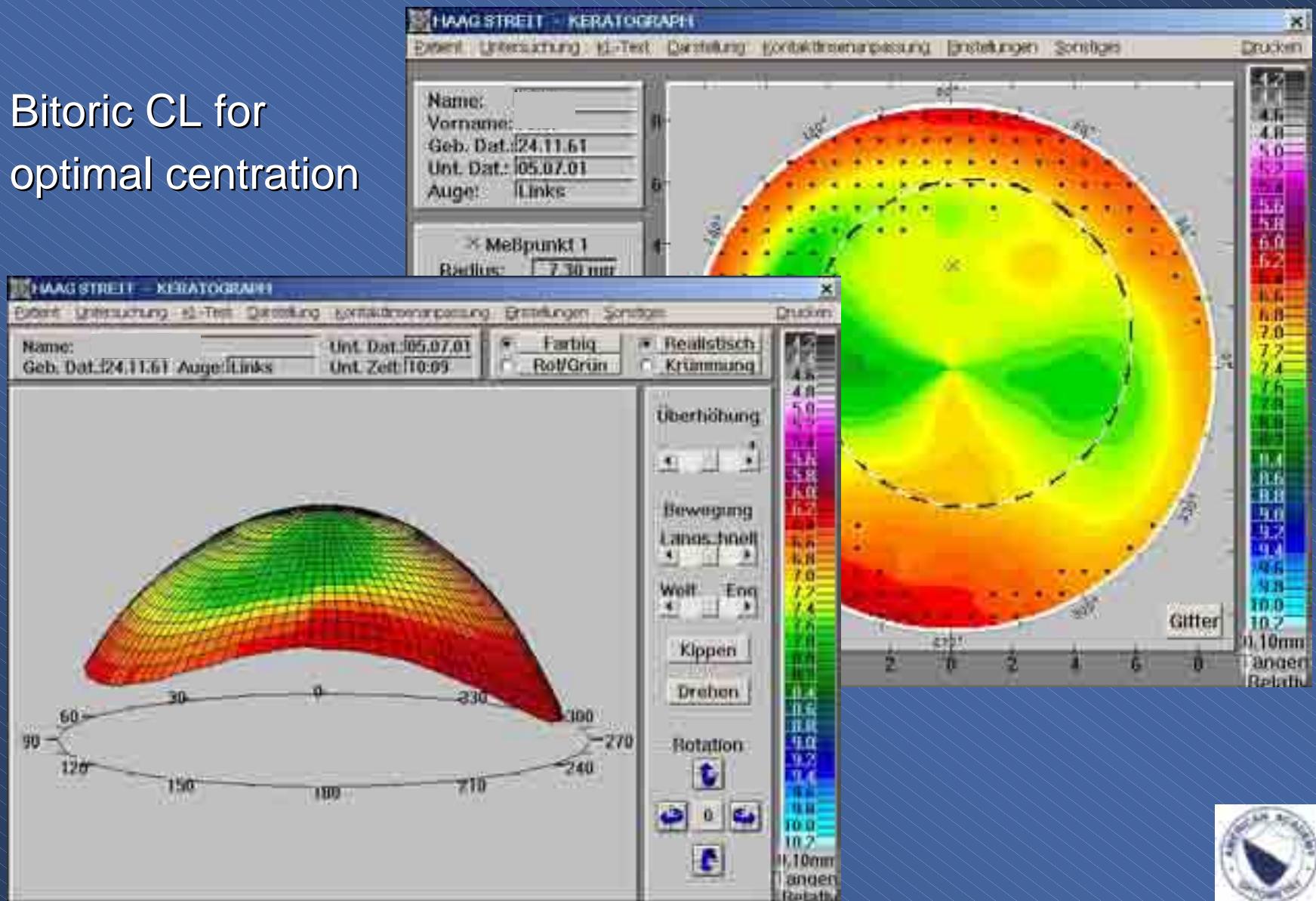
Pellucid marginal or Terrien Degenerations

Backtoric CL  
n.E. 0,8 / 0,0  
BC 8,40 / 7,90  
OAD 10,4mm  
Vcc 20/20

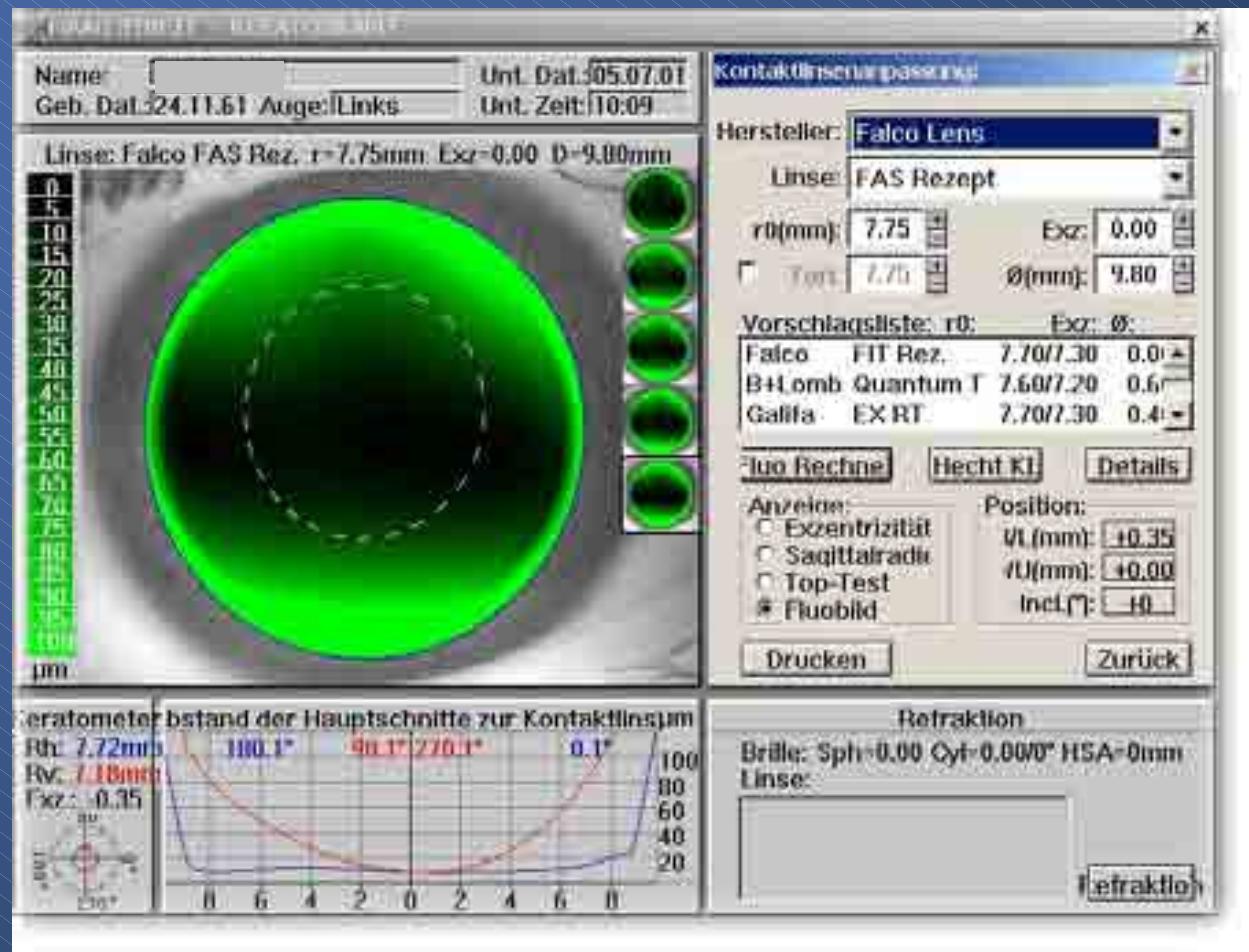


# Case # 9 post-Keratoplasty

Bitoric CL for  
optimal centration



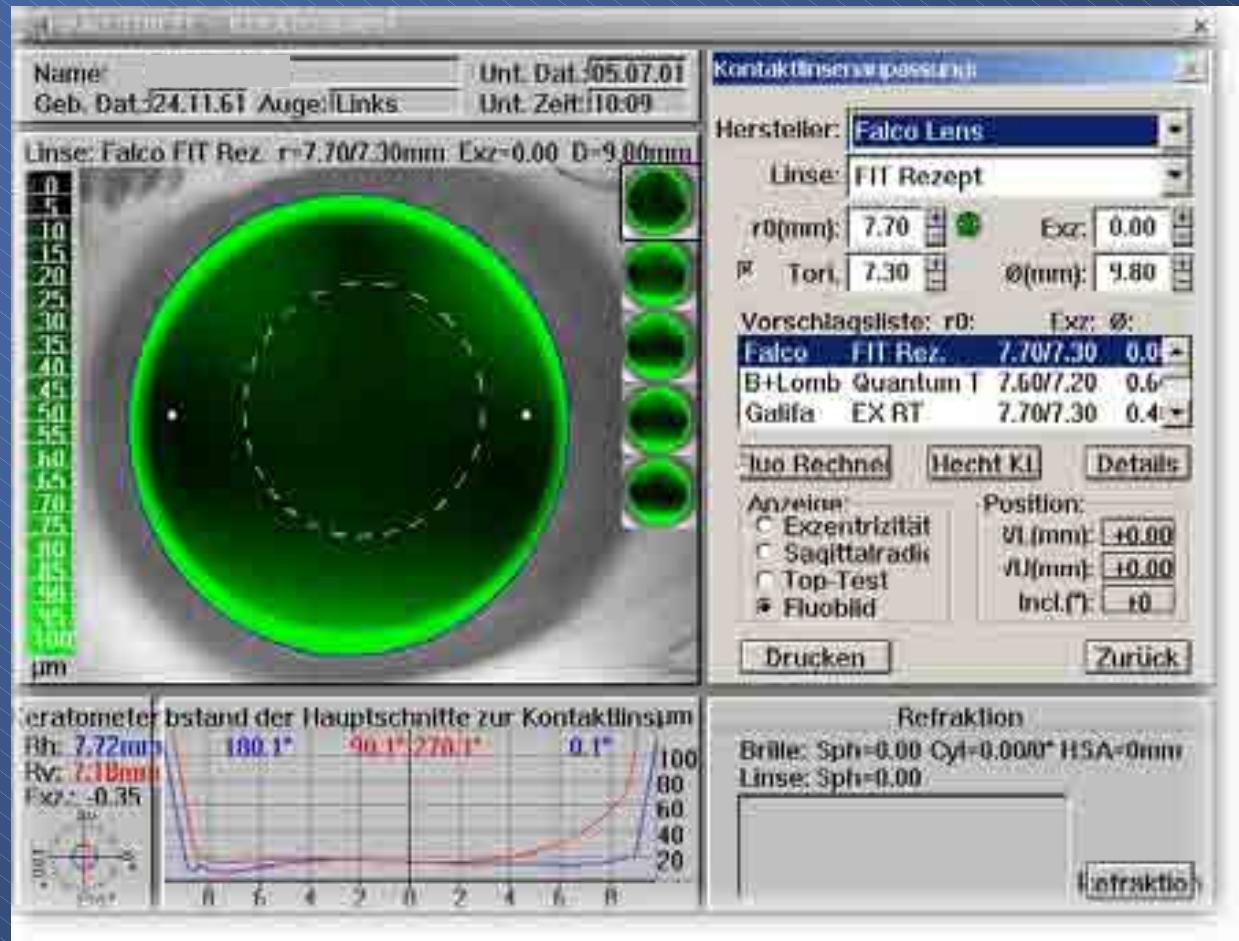
# Case # 9 post-Keratoplasty



„Standart“ lens spheric n.E. 0.0 BC 7.75  
 Vertical much too flat



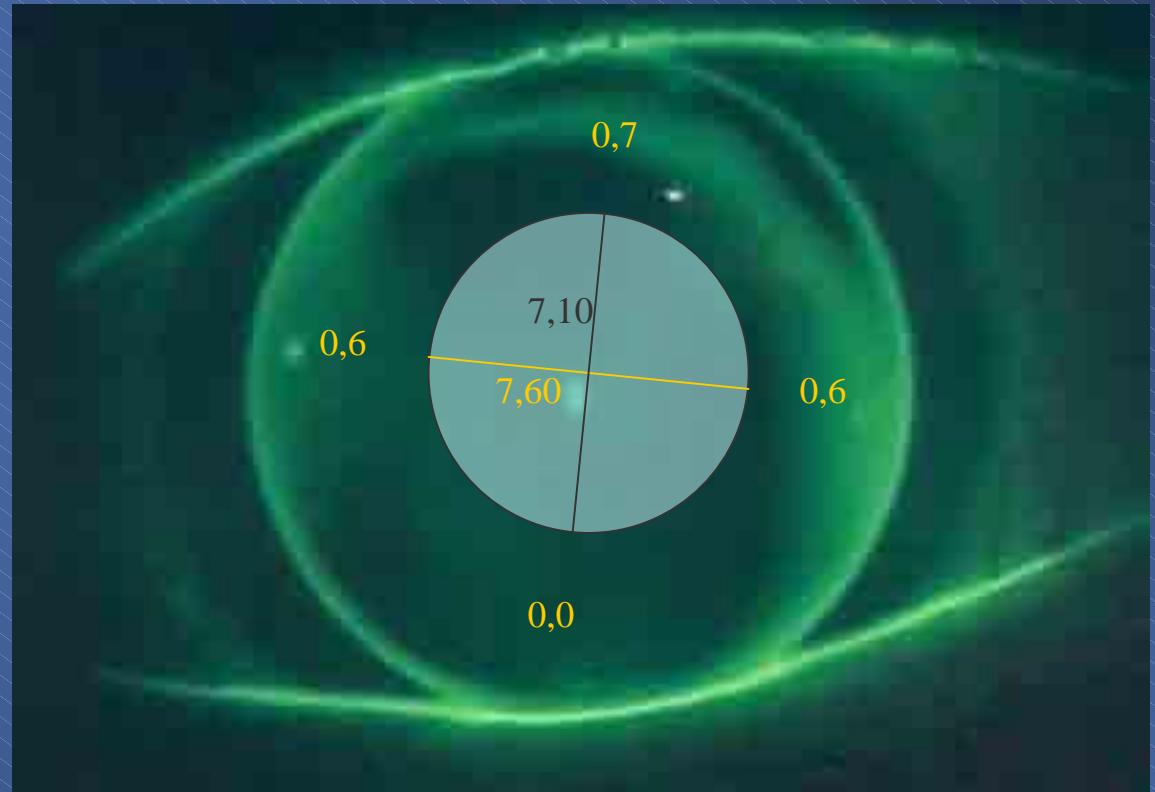
# Case # 9 post-Keratoplasty



Backtoric n.E. 0.0 BC 7.70 / 730  
Better, but still vertical too flat



# Case # 9 post-Keratoplasty



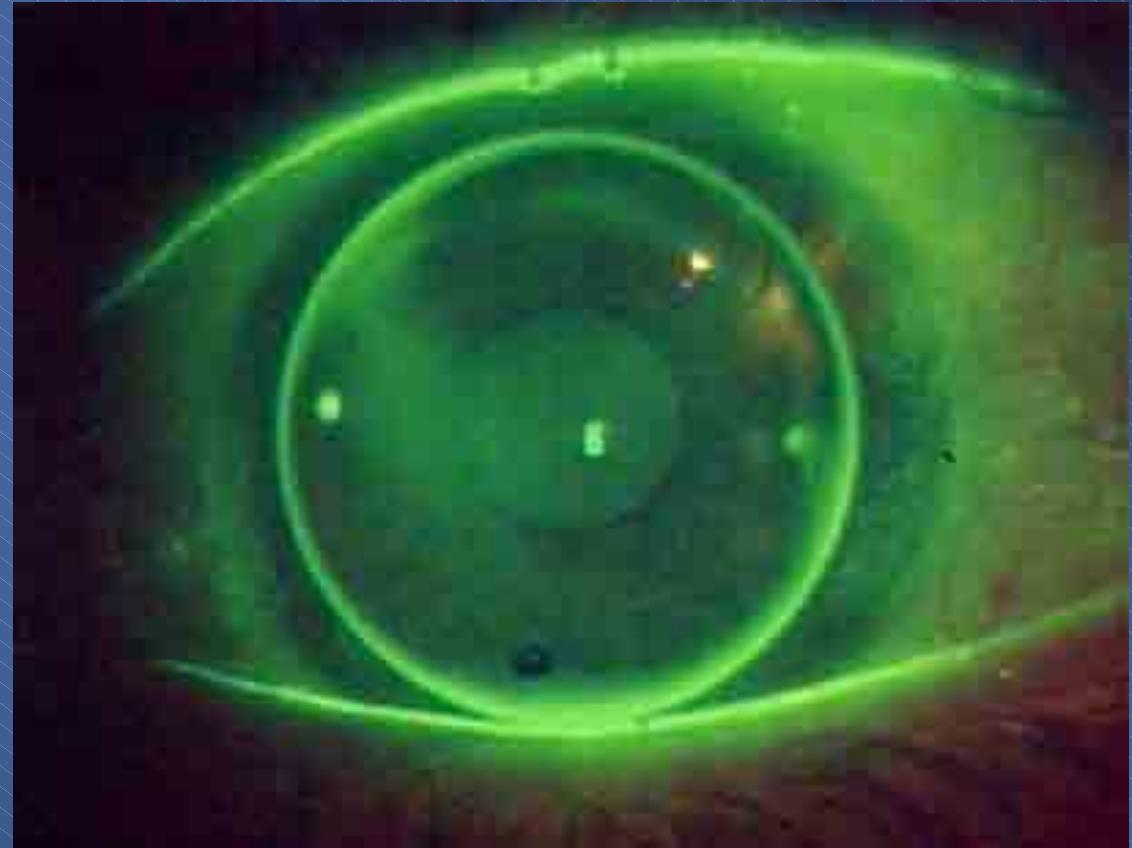
Previous „final“ lens Bi-toric

FITQT 06/06/07/00 HDS green 7,60 / 7,10 -3,87 =- 1,0 102° 9,8 mm

Better but : Dezentration and too flat horizontally



# Case # 9 post-Keratoplasty



Final lens Bi-toric

FITQT 00/00/07/00 HDS grün 7,50 / 7,00 -3,75 =- 1,25 97° 9,5 mm



# Case # 10 post-Trauma

Cause of trauma : Scissors



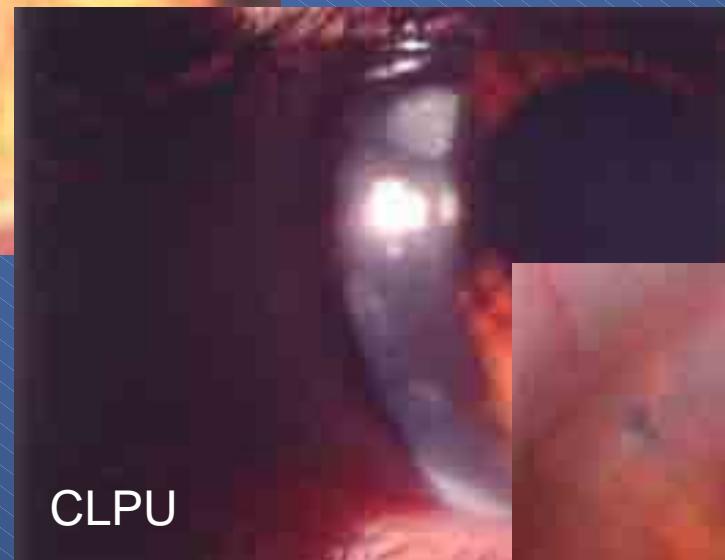
Large spherotoric  
CL to correct the  
high amount of  
irregularity



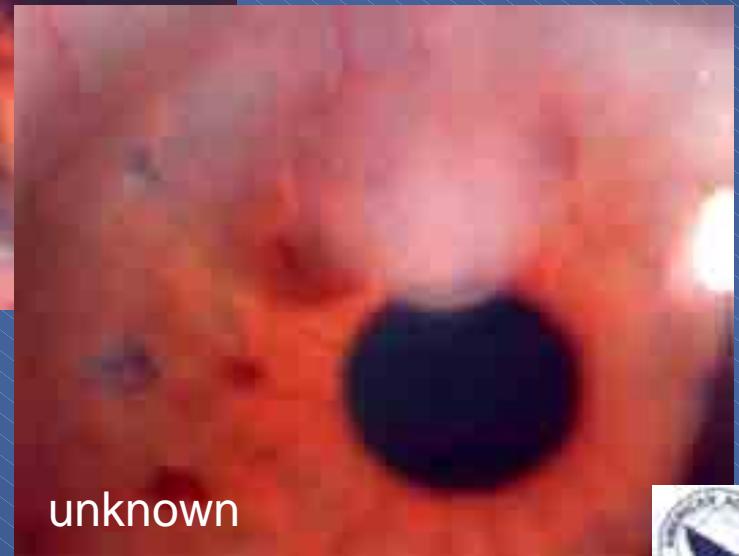
# Case # 11 post-infectious



Corneal scars



CLPU



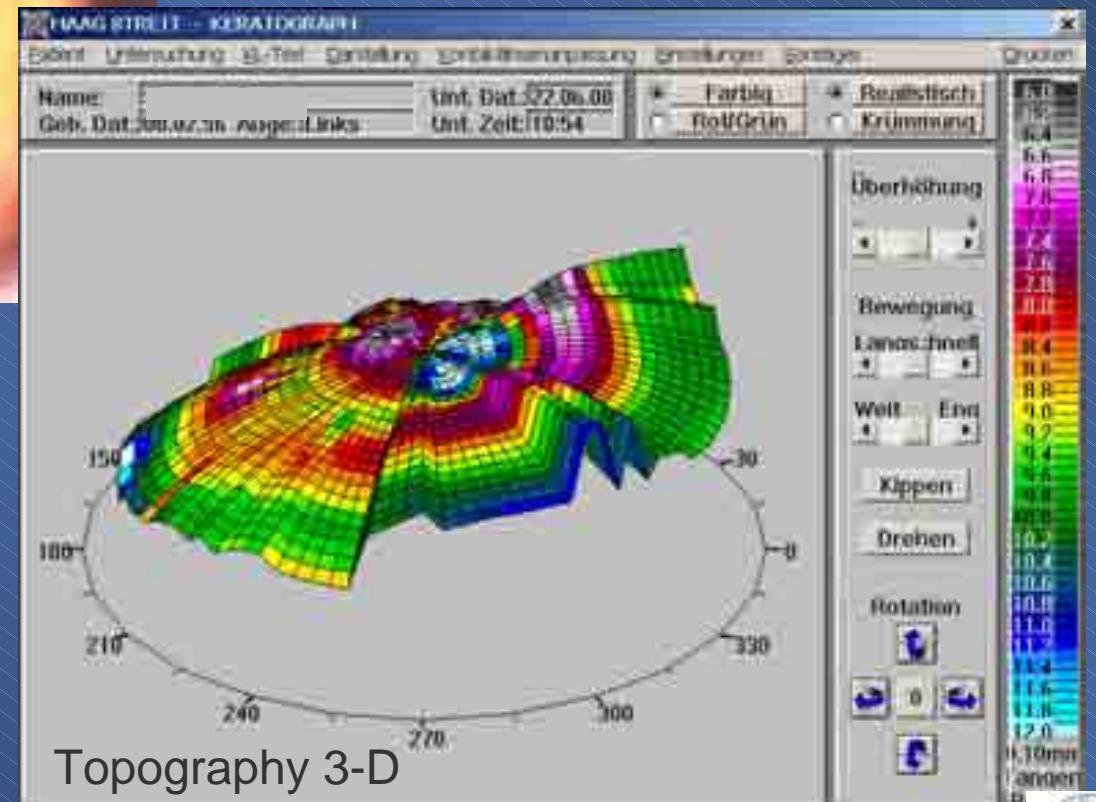
unknown



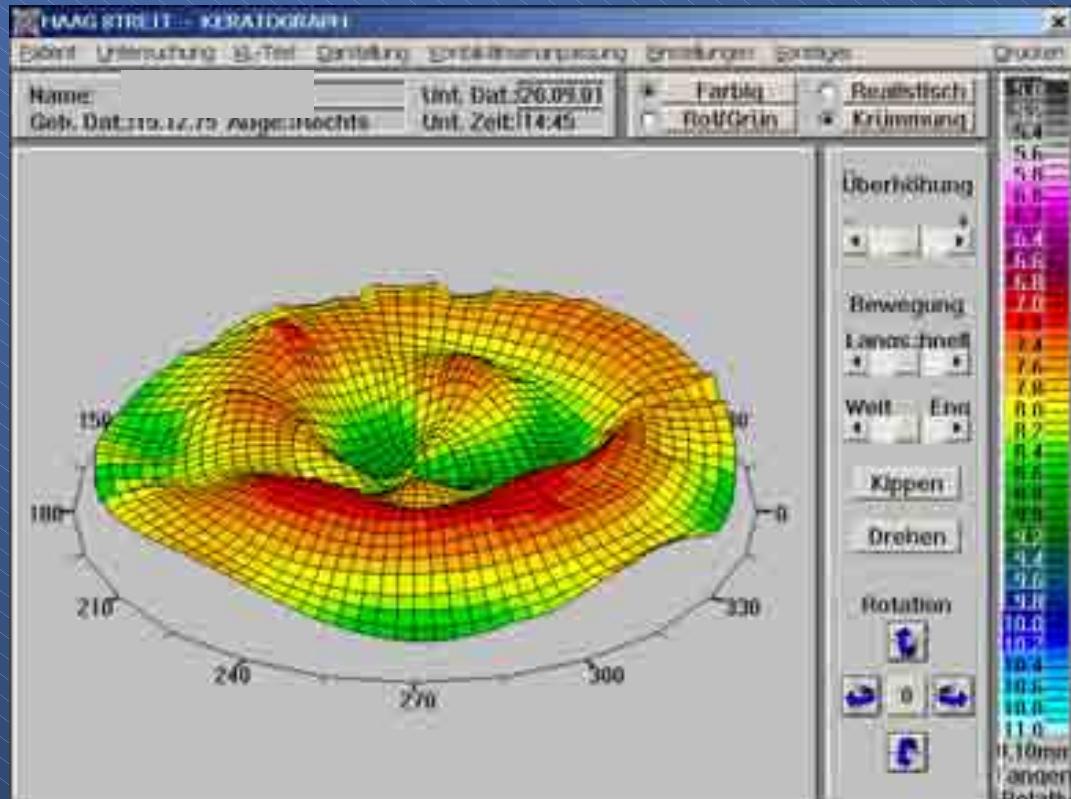
# Case # 11 post-infectious



Corneal scars



# Case # 11 post-infectious Herpes



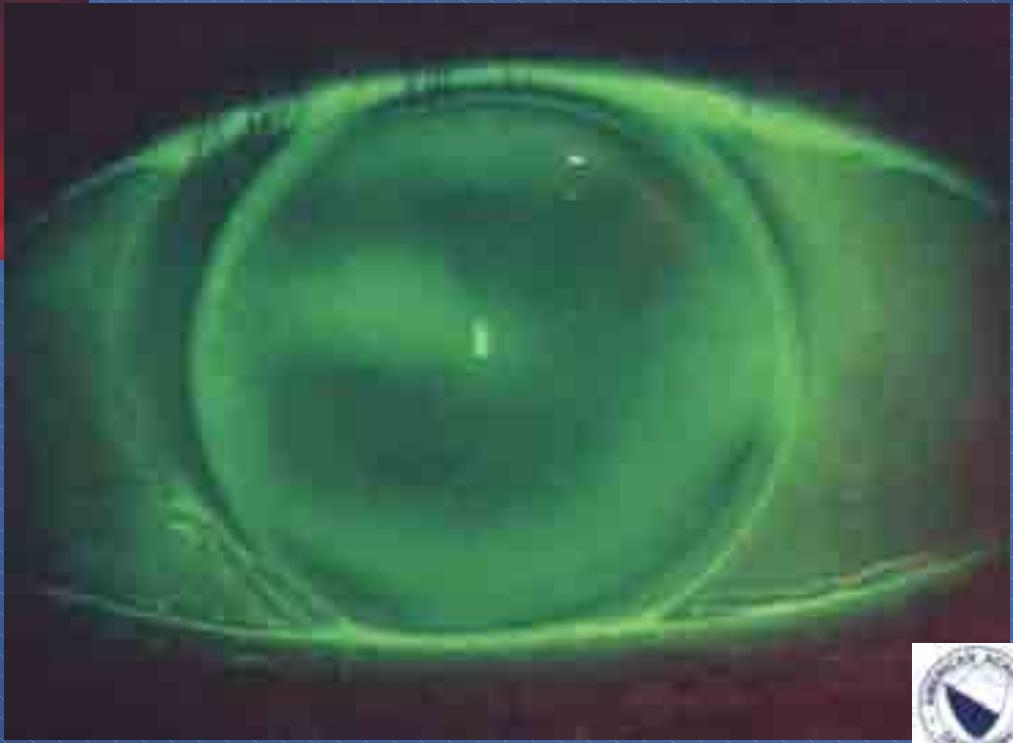
Corneal scar (Herpes)



# Case # 11 post-infectious Herpes



Backtoric CL  
n.E. 0,0/0,0 BC 8,40/8,10 10,4mm



# Case # 12 Toric ortho-K

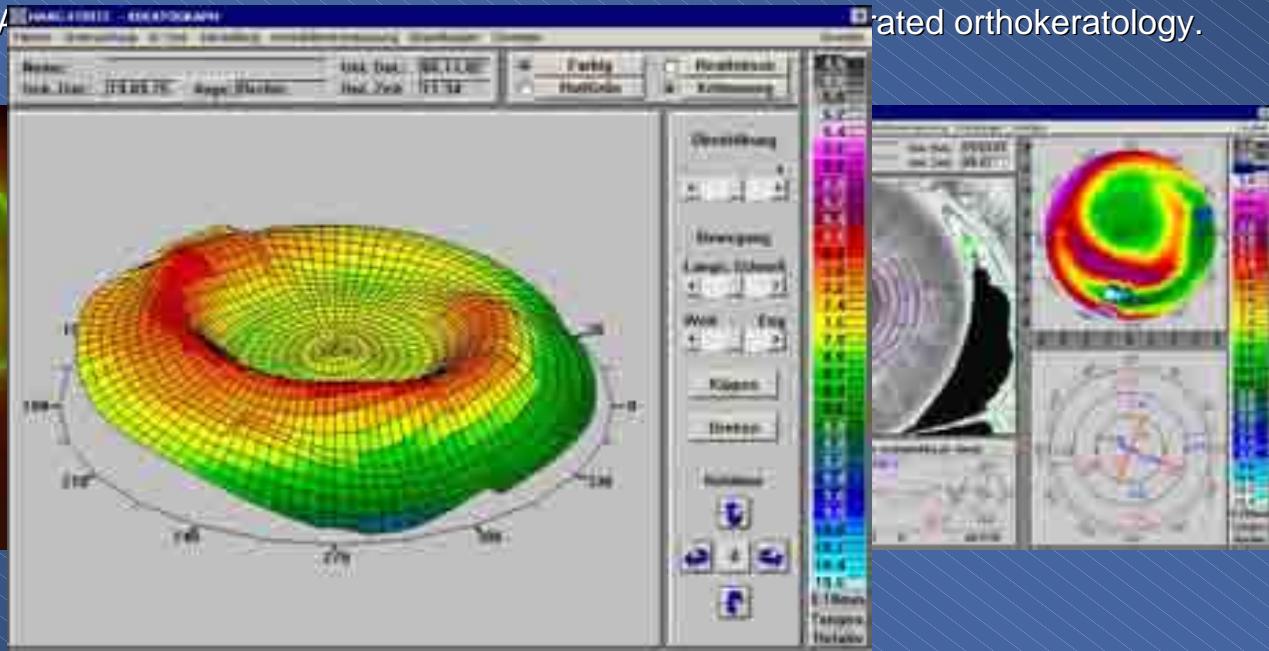
## Ortho-K



# Case # 12 Toric ortho-K

...., it reduces pre-existing astigmatism by an average of only 50 per cent and it does not do so reliably either for magnitude or direction. These results provide two useful patient selection criteria for orthokeratology. They are : assuming 0,50 to 0,75 D of astigmatism is a satisfactory outcome, orthokeratology can be expected to be successful for pre-fitting astigmatism of up to 1,00 D to 1,50 D; and the greater the pre-existing astigmatism, the less likely orthokeratology is to be successful.

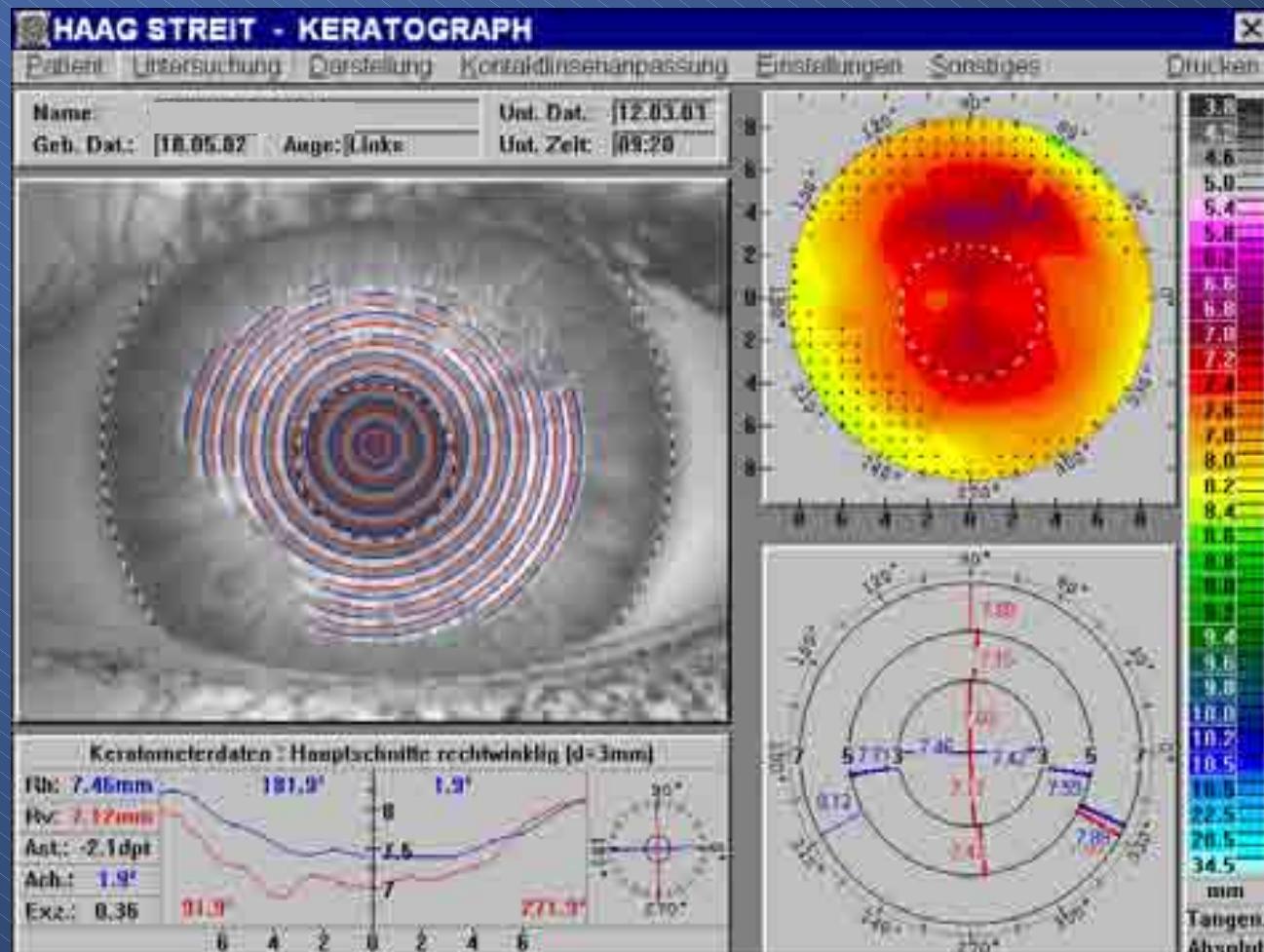
Mountford J, Pesudovs K : A review of accelerated orthokeratology.



Modern accelerated orthokeratology was limited to corneal astigmatism < 1,50 D



# Case # 12 Toric ortho-K

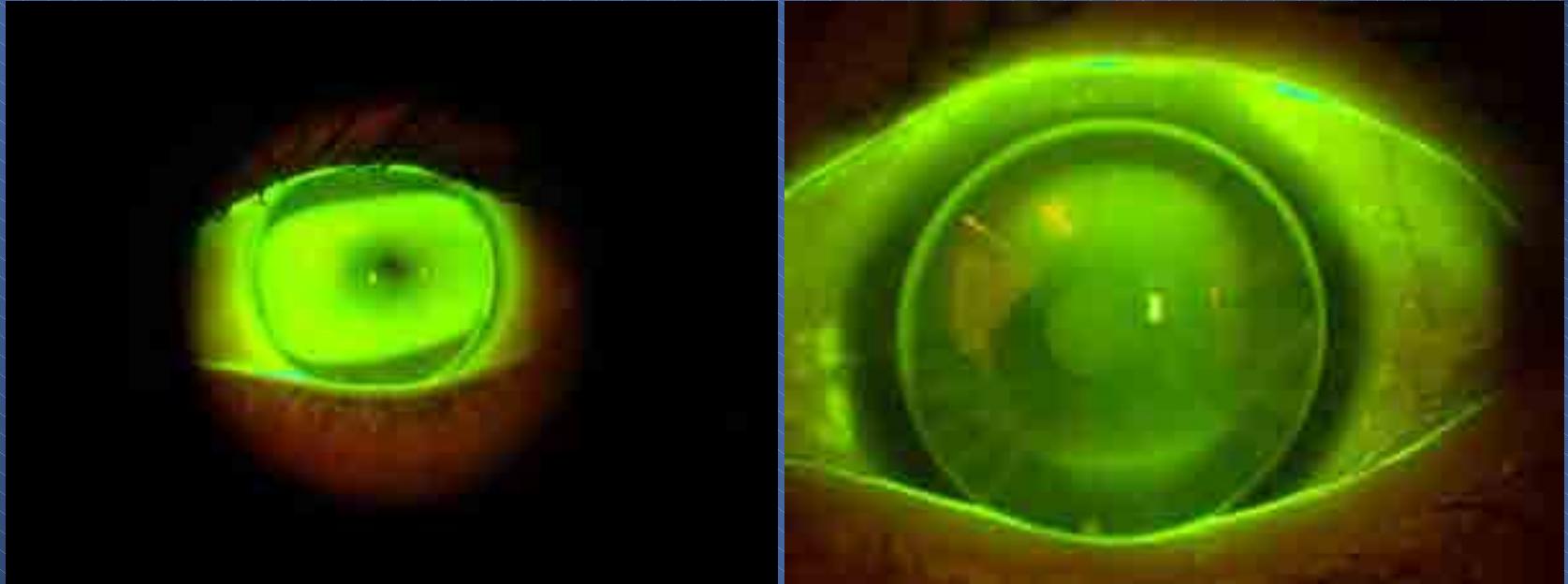


Astigmatism : -2,1 D rectus



# Case # 12 Toric ortho-K

## Sphero-toric OK – fsa



1. Day : -2,1 dpt

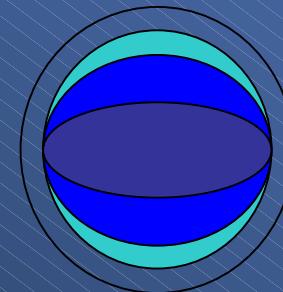
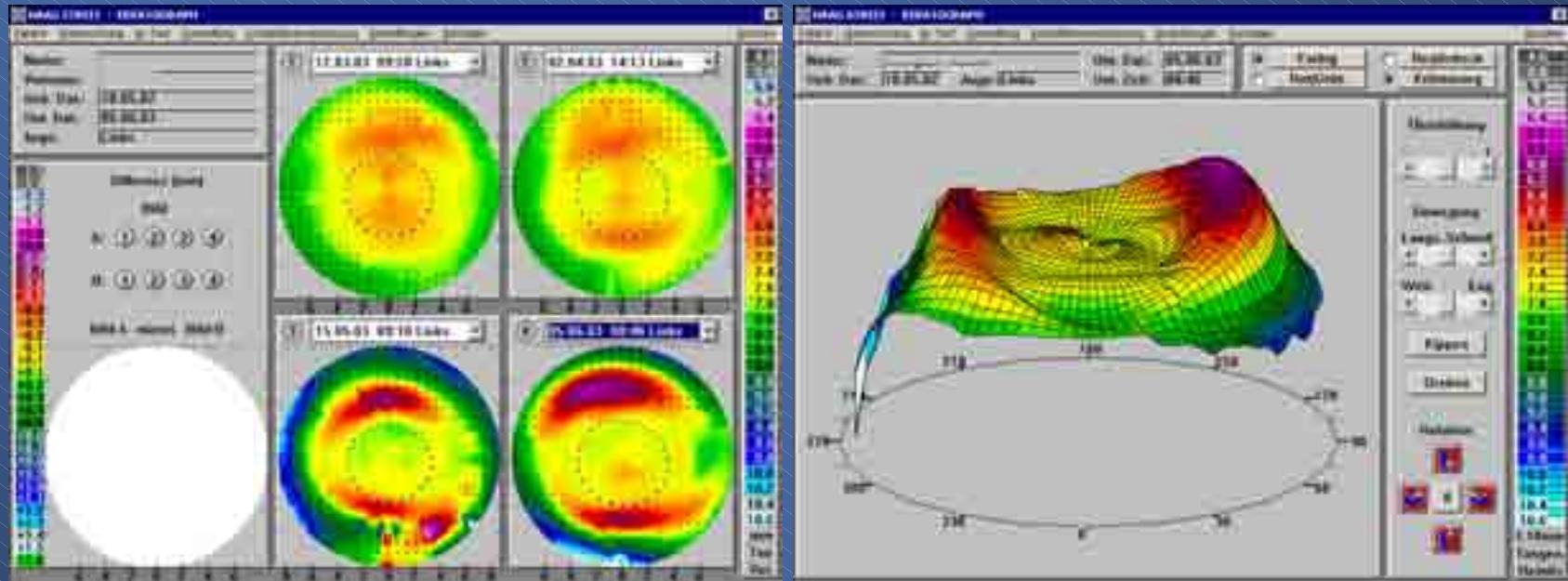
In US : Fargo lenses

6 Weeks : - 0,5 dpt



# Case # 12 Toric ortho-K

## Sphero-toric OK – fsa



Central optic zone  
Toric reverse zone  
Alignment zone  
Bevel

4-curve, peripheral-toric reverse design (Baertschi-Falco OK toric = BFOK fsa 00/rev)

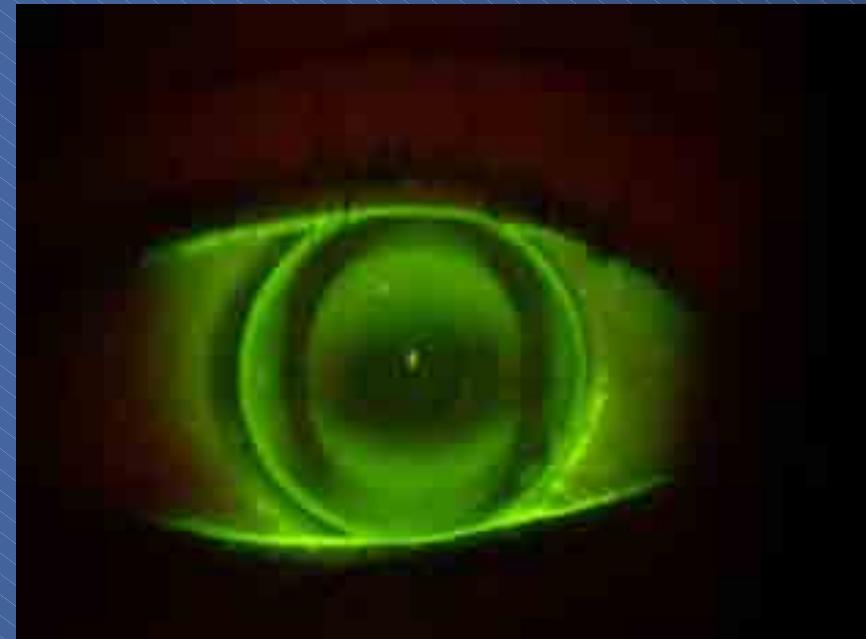


# Case # 12 Toric ortho-K

OK - X



1. Day  $-0,25 -2,50 180^\circ$

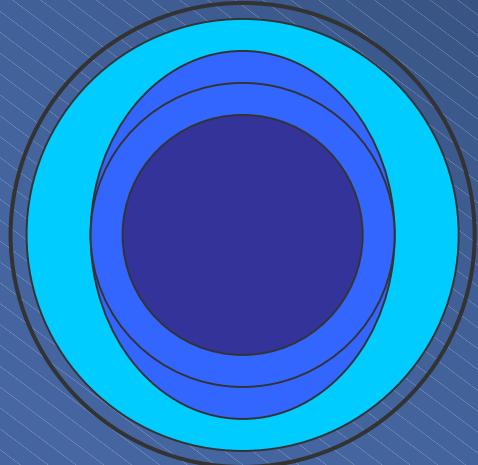
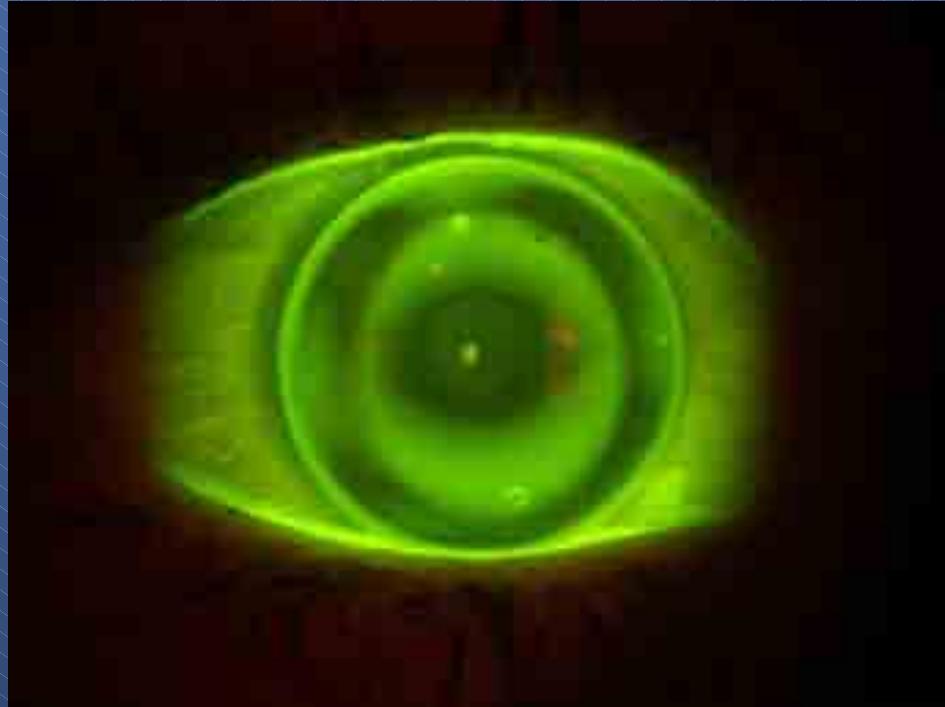


6 Weeks  $+ 0,25 -0,75 180^\circ$



# Case # 12 Toric ortho-K

## OK – X



4/5 curve, peripher-toric double reverse design

(Baertschi-Falco OK toric BFOK-X)



# Conclusion and Discussion

Evidence for :

- qualitative and quantitative cornea analysis by topography and fluorescein imaging
- Fitting know-how for toric CL and the use of fantasy and imagination
- Technical possibilities of your personal CL laboratory



# Conclusion and Discussion

For happier patients !





Thank you !

