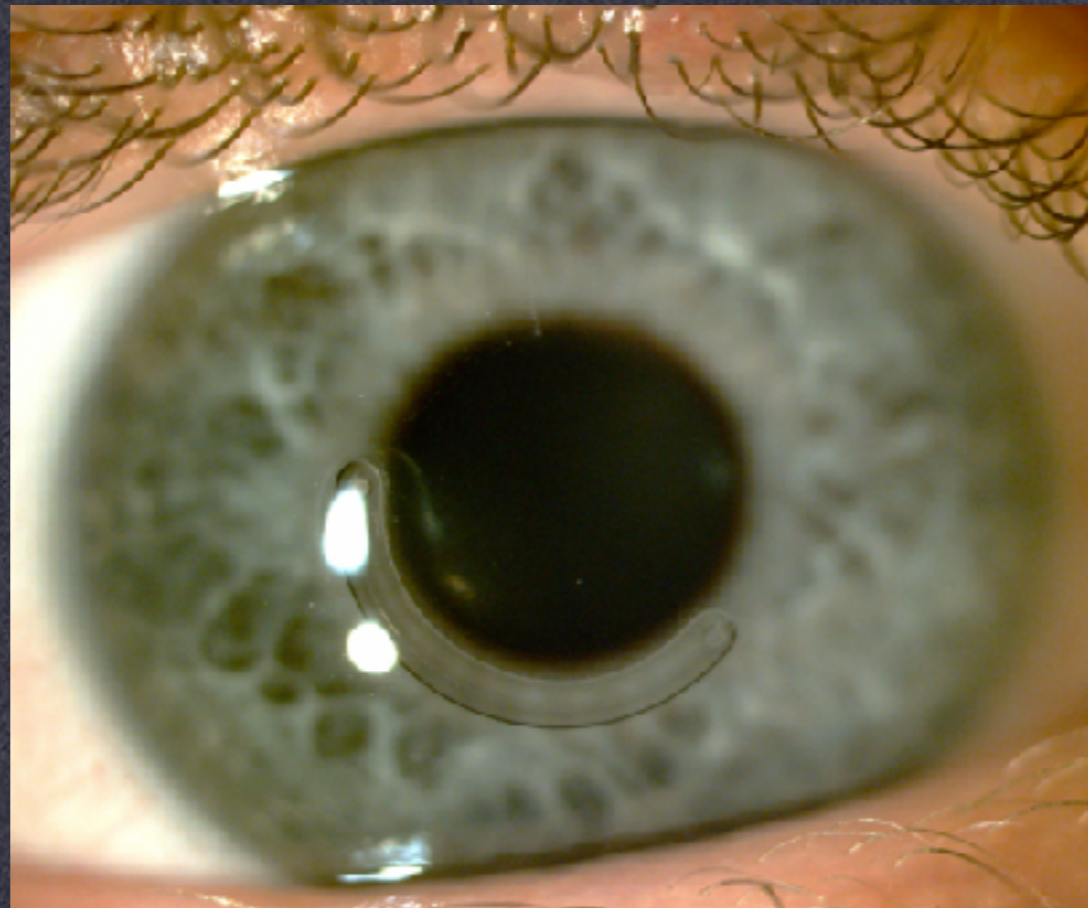


XVIII Congresso Internacional de
Catarata e Cirurgia Refrativa

El Congreso Internacional de Administración en Oftalmología
El Congreso Internacional de Administración en Oftalmología
El Curso de Actualización en Oftalmología para Oculistas de Catarata y Refractiva

2018 | 18 a 19 de maio
Duração: 2 dias | 18h 00min | 18h 00min | 18h 00min



HOW TO CHOOSE THE ICRS

LEONARDO TORQUETTI, MD, PHD

CENTRO DE EXCELÊNCIA EM OFTALMOLOGIA
PARÁ DE MINAS - MG
WWW.CEOCLINICA.MED.BR

FERRARA RING NOMOGRAM

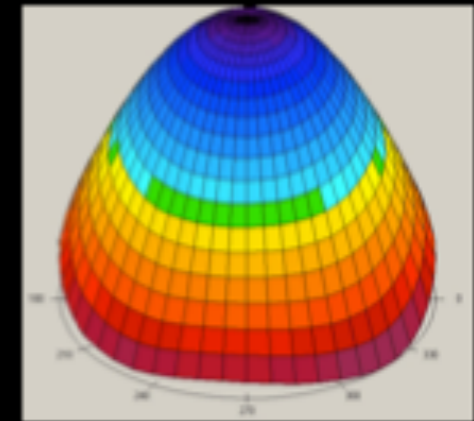
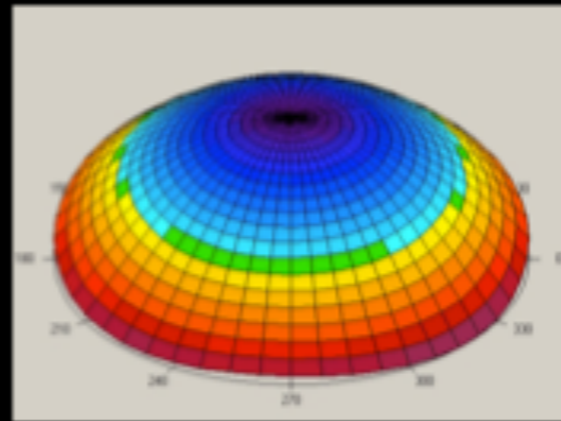
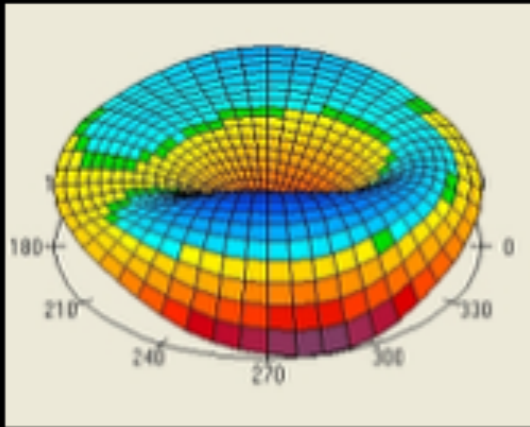
Evolution of the Nomogram

(criteria for ring selection)

- First generation (1997 - 2002): keratoconus grade
- Second generation (2002 - 2006): spherical equivalent
- Third generation (2006 - 2009): topographic astigmatism
- Fourth generation (May 2009 to 2018): asphericity (Q)
- Fifth generation (2018): **posterior elevation**

ASPHERICITY (Q)

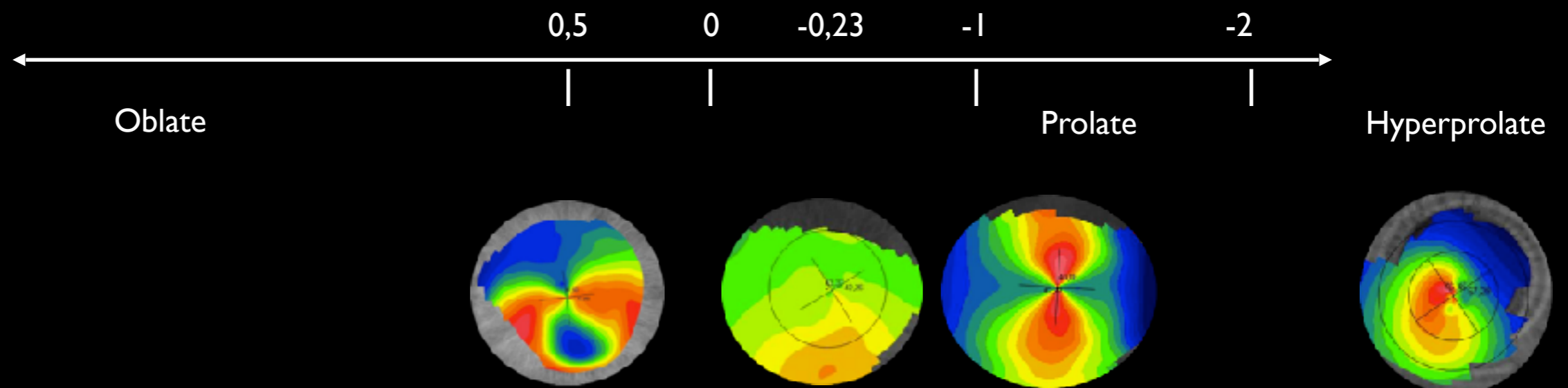
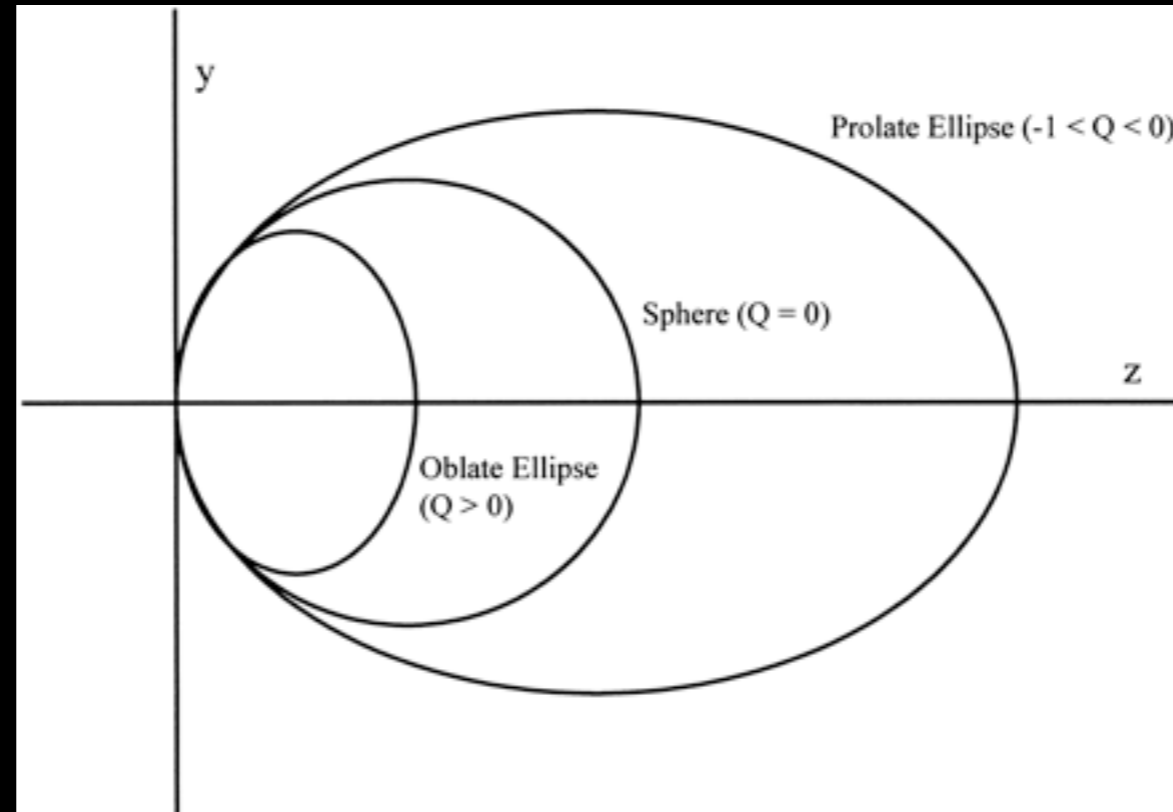
- Corneal asphericity (Q) – corneal shape;
- OblateProlate;



- “Normal”: mild prolate Keratoconus: hyper prolate cornea;
- Normal Q value: - 0.23¹

1. Yebra-Pimentel E, González-Méijome JM, Cervino A, et al. Asfericidad corneal en una población de adultos jóvenes. Implicaciones clínicas. Arch Soc Esp Oftalmol 2004; 79:385-392

CORNEAL ASPHERICITY



NOMOGRAM

- The asphericity is the best parameter, at the present moment, for ring selection;
- There is a tendency to implant “less” tissue to achieve the same (or better) correction than was achieved in the past;
- Q value = Quality of vision

WHAT IS THE ROLE OF POSTERIOR ELEVATION IN THE NOMOGRAM?

- To identify map patterns that correlates with sagittal anterior maps;
- Easier pattern (posterior elevation) classification when compared with sagittal anterior maps;
- Better reproducibility;
- **Better agreement in surgical planning among doctors.**

POSTERIOR ELEVATION MAPS

GEOGRAPHY LANDMARKS

LAGOON

is a shallow body of water separated from a larger body of water by barrier islands or reefs



ISTHMUS

is a narrow piece of land connecting two larger areas across an expanse of water by which they are otherwise separated



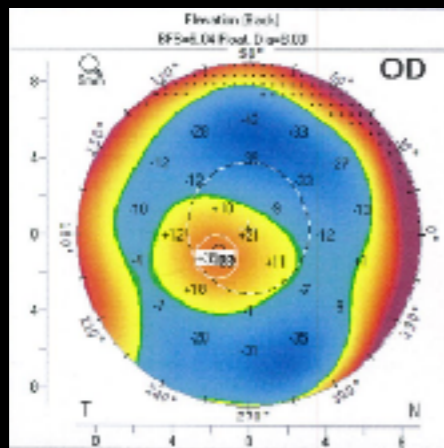
PENINSULA

is a piece of land surrounded by water on the majority of its border, while being connected to a mainland from which it extends.

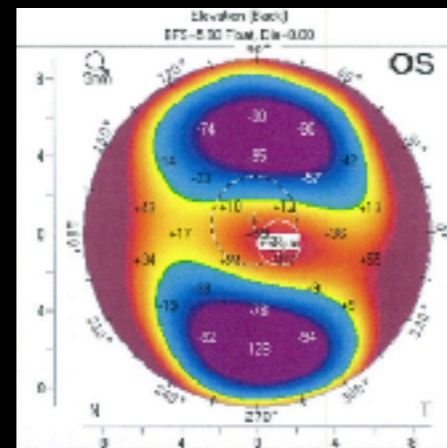


POSTERIOR ELEVATION MAPS

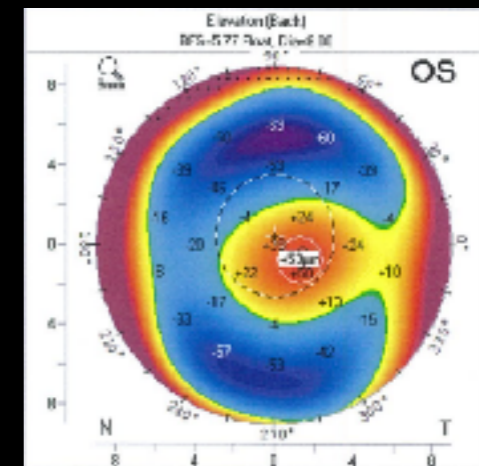
LAGOON



ISTHMUS

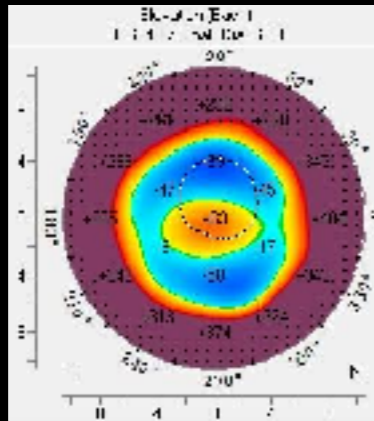


PENINSULA

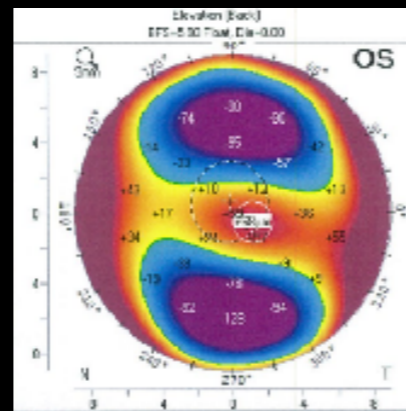


POSTERIOR ELEVATION MAPS

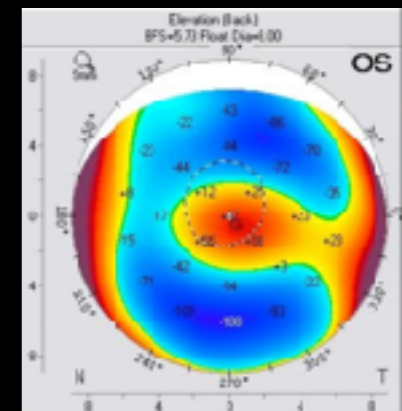
LAGOON



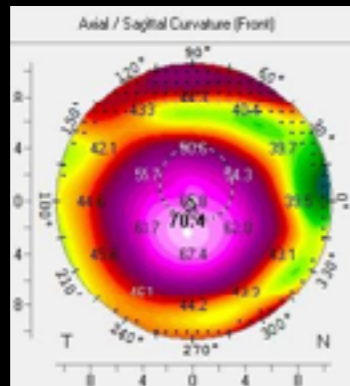
ISTHMUS



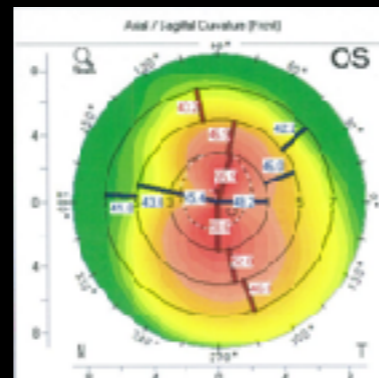
PENINSULA



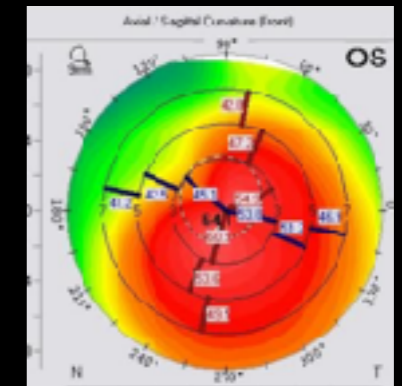
NIPPLE



BOW-TIE / ASTIGMATIC

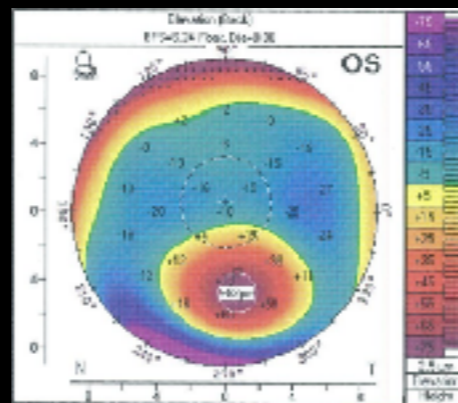


OVAL

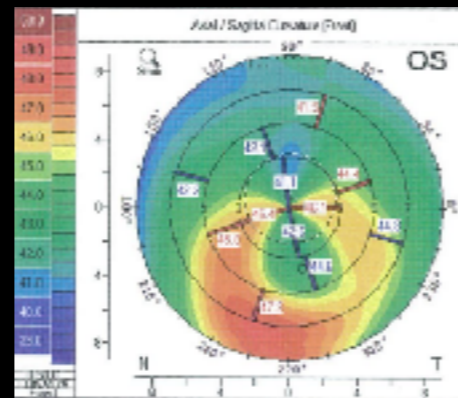


POSTERIOR ELEVATION MAPS

DECENTERED LAGOON



PMD / PMD "LIKE"

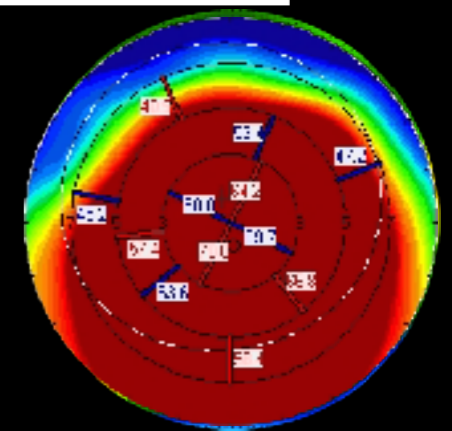


ASPHERICITY X KERATOMETRY X ASTIGMATISM

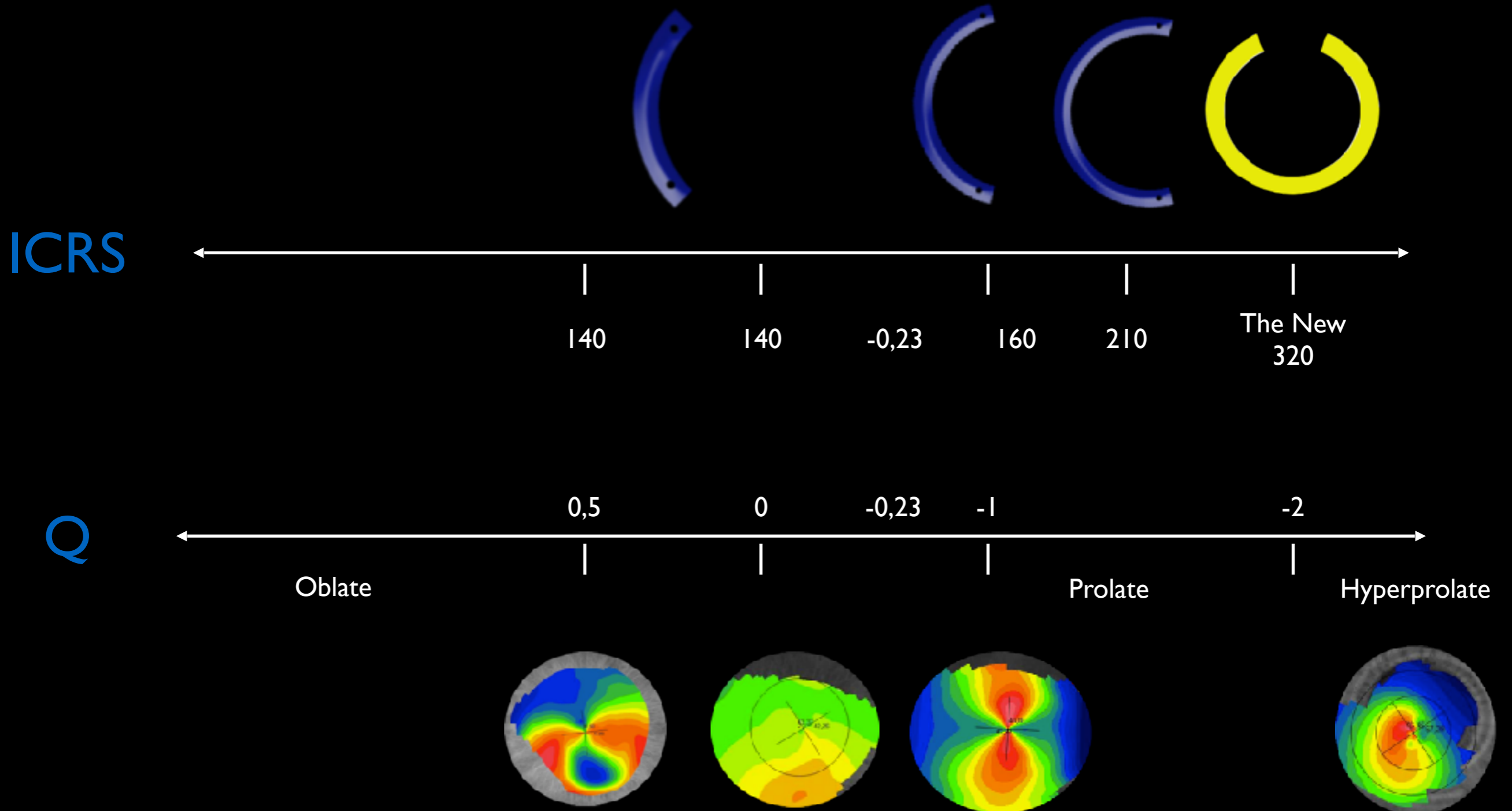
	Q	K	Cyl
140 (arc)	↑	↓	↓↓↓
160 (arc)	↑↑	↓↓	↓↓
210 (arc)	↑↑↑	↓↓↓	↓
320 (arc)	↑↑↑↑	↓↓↓↓	↓↓

160 arc = 21.6% = 11.5 D of coma ("standard" ring)

- Q negative (negative hyperopia, prolate cornea)
- High K values (high K values)
- High astigmatism to high astigmatism



CORNEAL ASPHERICITY x ICRS ARCH LENGTH



NOMOGRAM

General Guidelines

IT MUST BE DETERMINED:

1. The type of keratoconus:

Central
Oval or Bow-tie
PMD



Nipple / Astigmatic

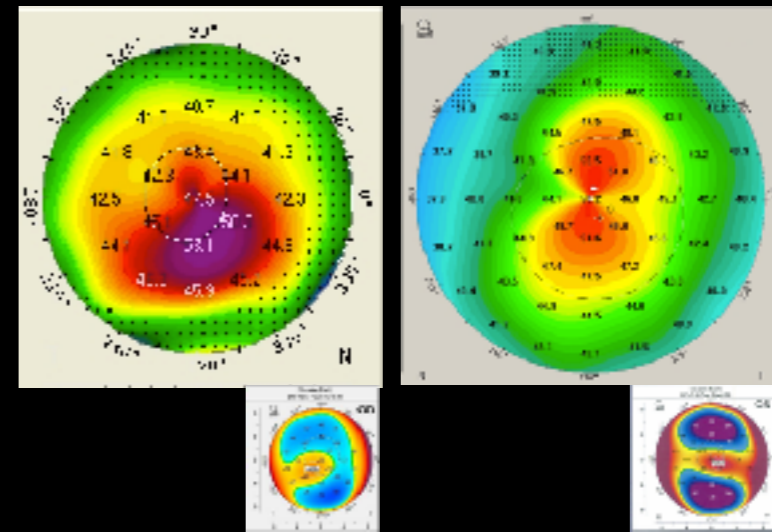
2. The corneal asphericity (Q)

3. The pachymetry at the corneal steepest axis and probable ring track (5 mm optical zone)

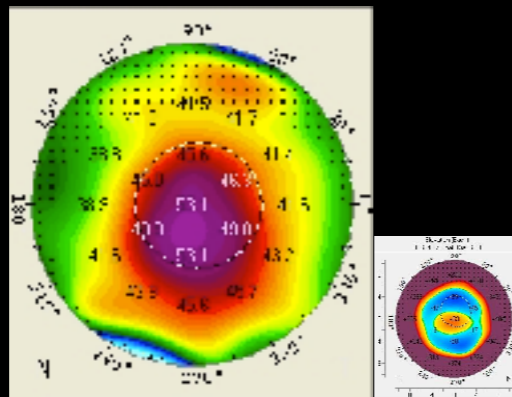
NOMOGRAM

1. Type of keratoconus

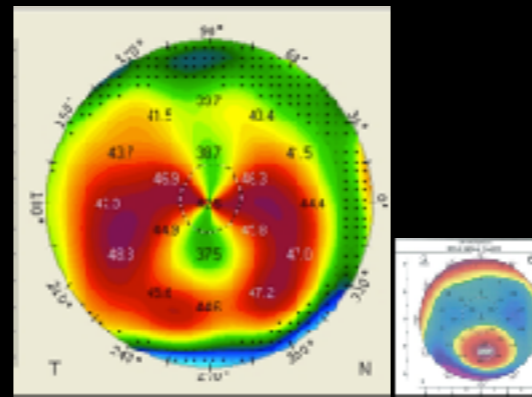
Oval / Bow-tie



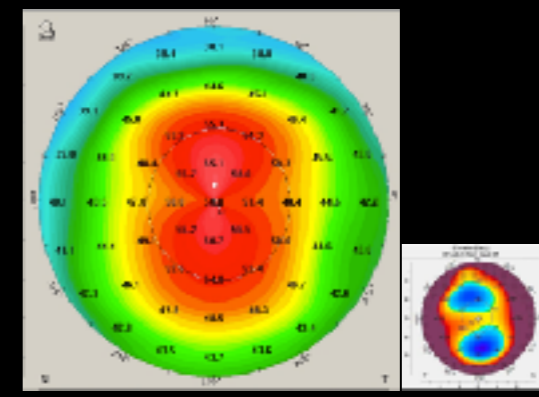
Nipple



PMD



Astigmatic



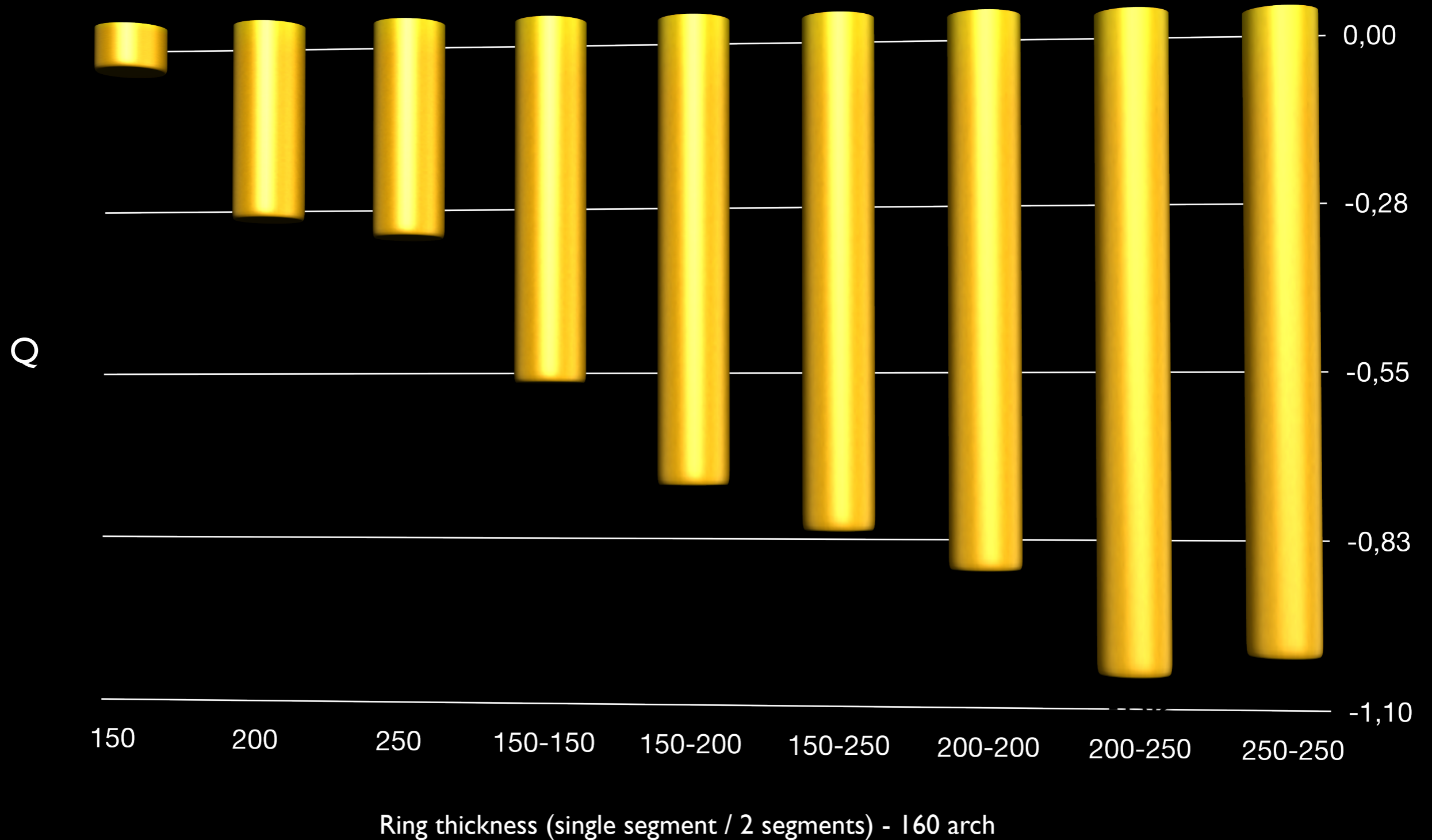
NOMOGRAM

2. The corneal asphericity (Q):

The selected ring for implantation may induce asphericity changes with a final result close to “normal” values (-0.23 ± 0.08)

160 - ICRS

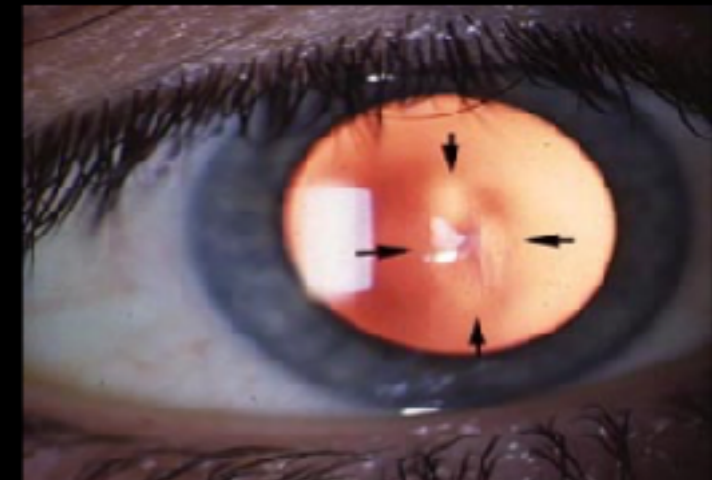
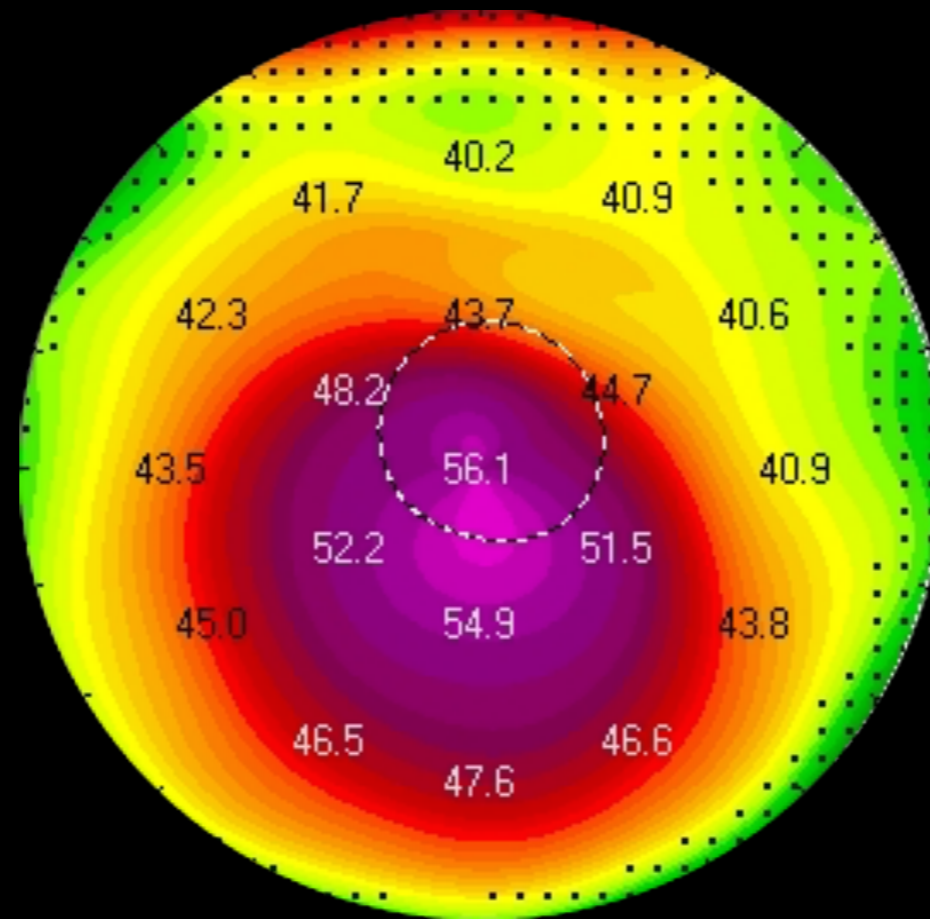
Q (asphericity) variation according to ring thickness*



*Torquetti L, Ferrara P. Corneal asphericity changes after implantation of intrastromal corneal ring segments in keratoconus. J Emmetropia, 2010; 1:178-181.

NOMOGRAM

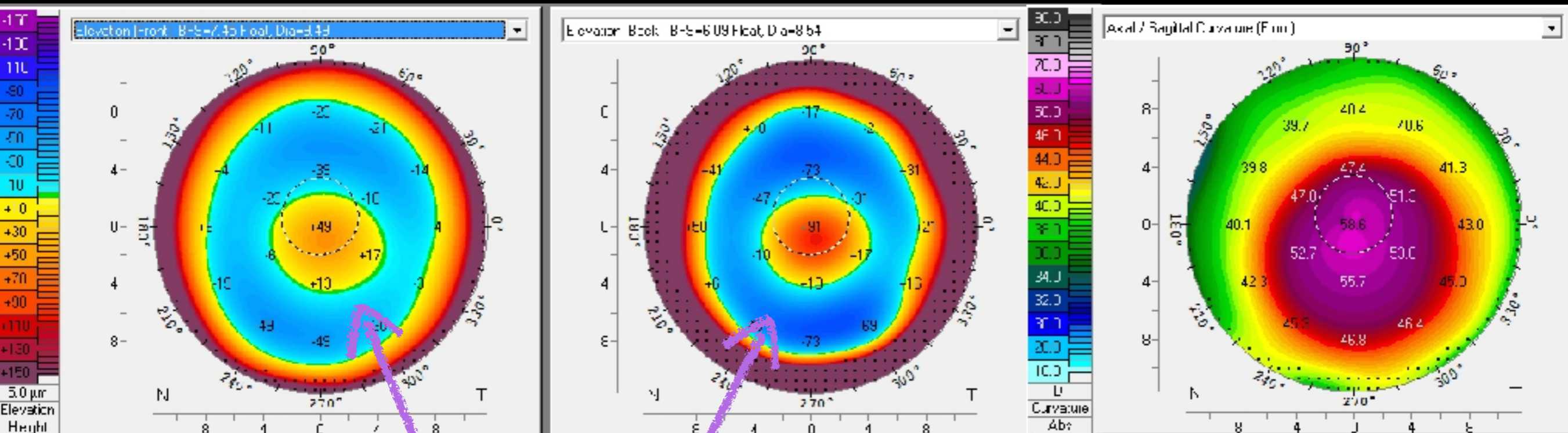
Nipple



Central location
Hiperprolate cornea
Low astigmatism
Lake in the elevation map

NOMOGRAM

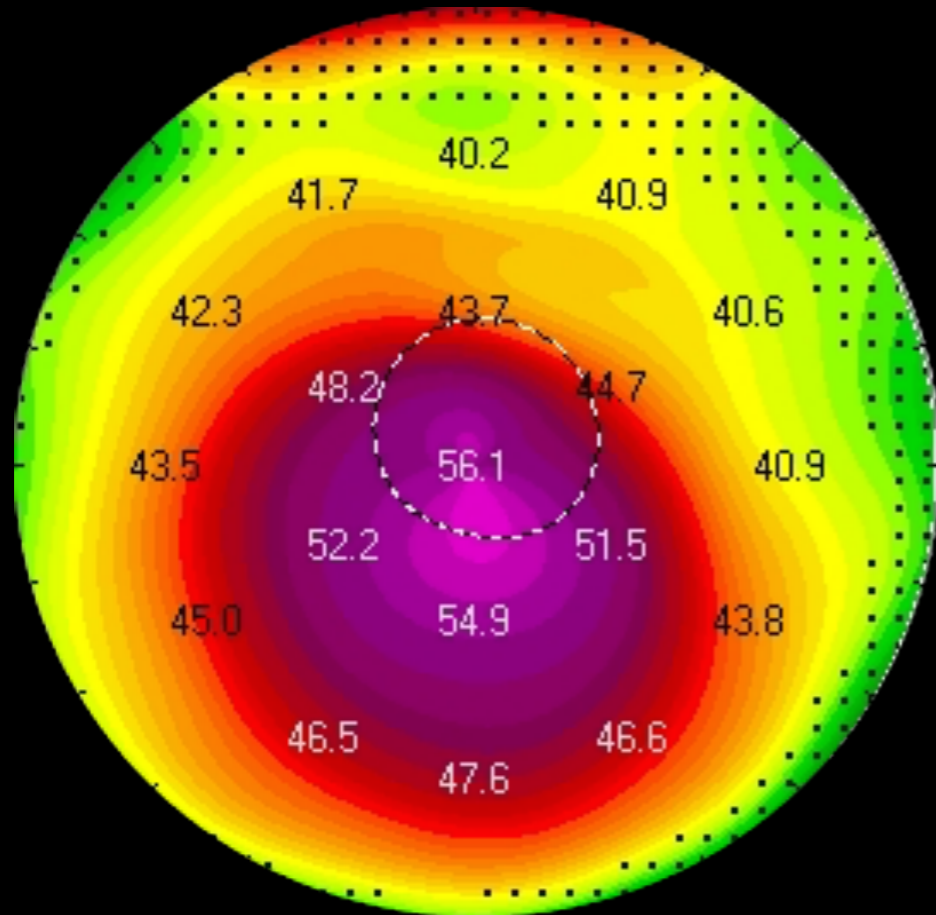
Nipple



Lagoon in the posterior elevation map

NOMOGRAM

Nipple



Q change induced by the 210 ICRS

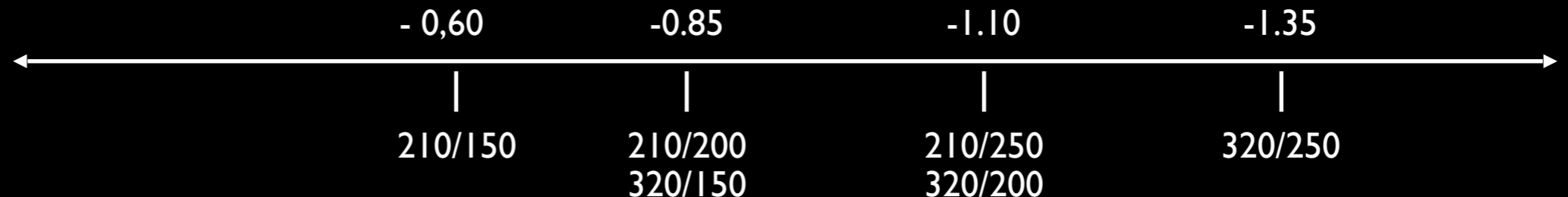
210/150	- 0.36
210/200	- 0.60
210/250	- 0.82

Q change induced by the 320 ICRS

320/150	- 0.53
320/200	- 0.89
320/250	- 1.14

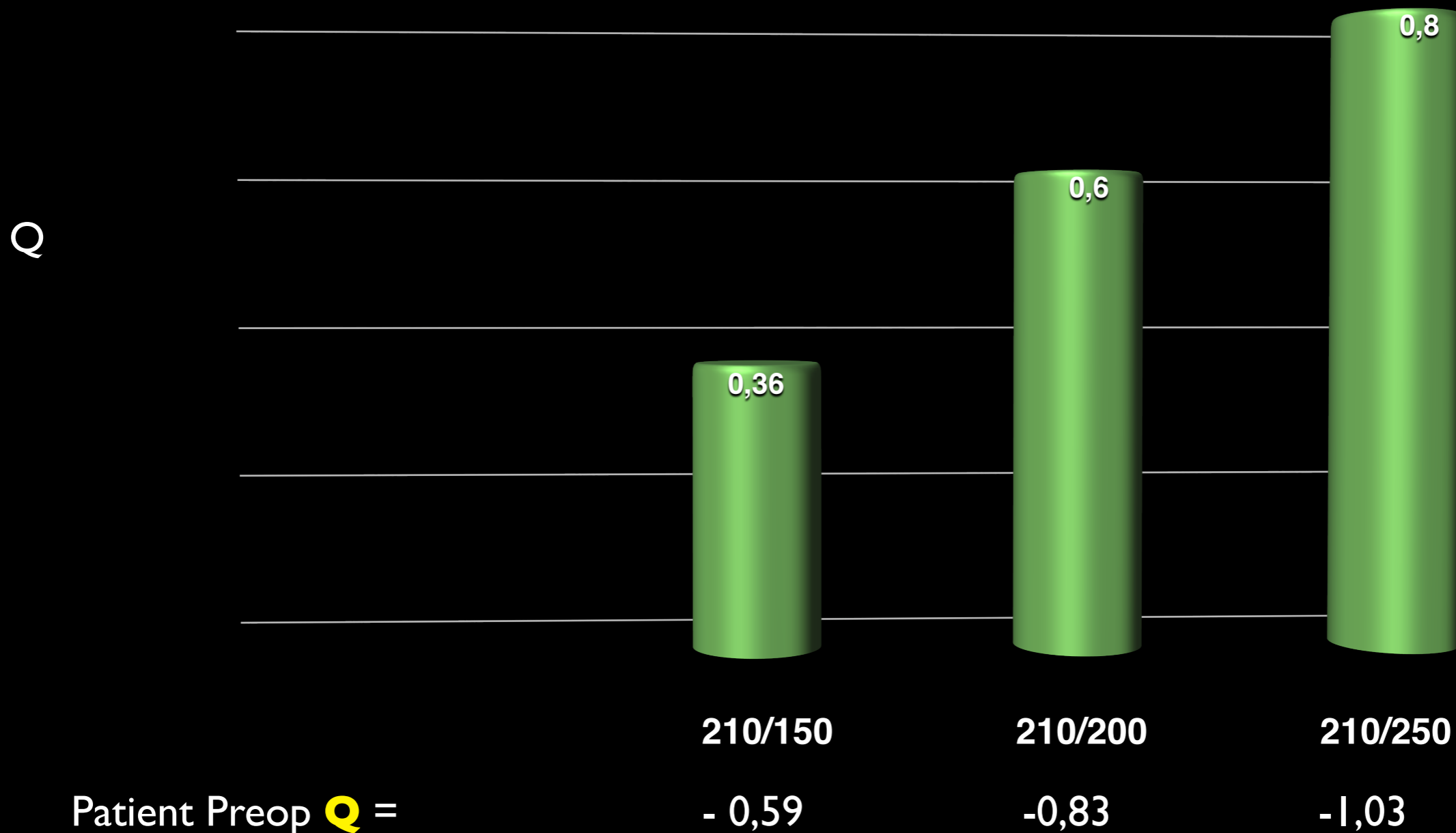
Nipple = 210 or 320

Preop Q



210 - ICRS

Q (asphericity) variation according to ring thickness*



Patient Preop Q =

NOMOGRAM

Nipple

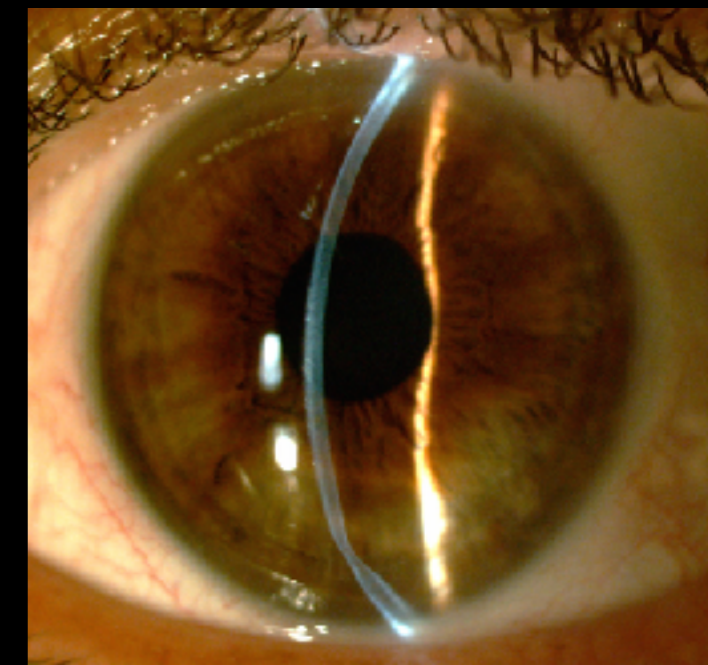
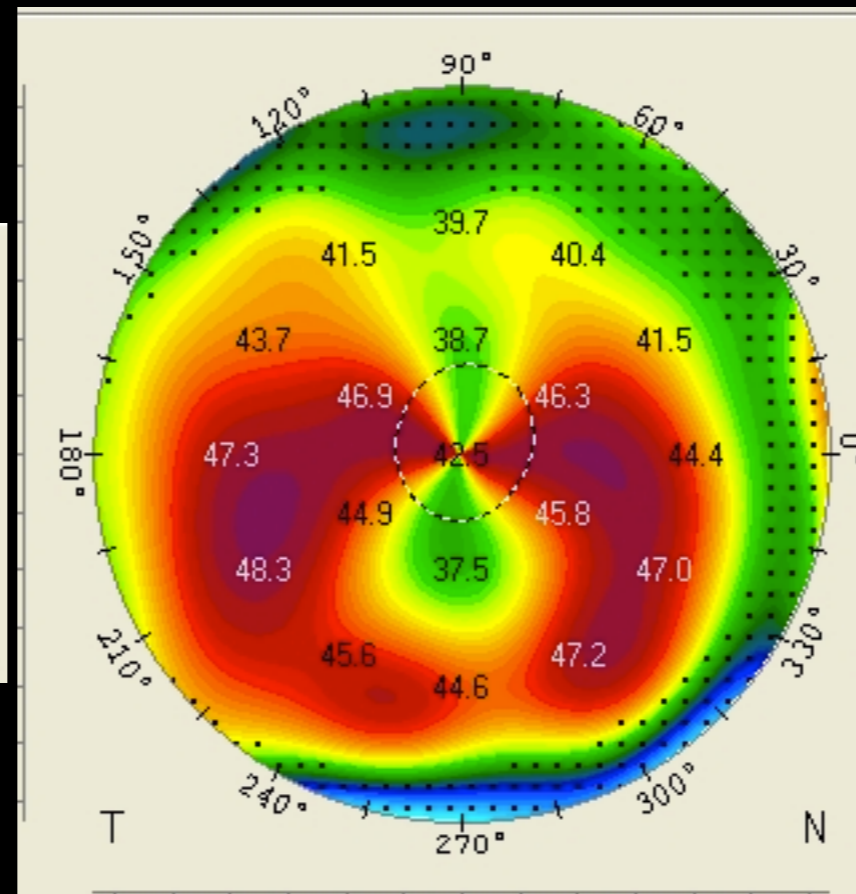
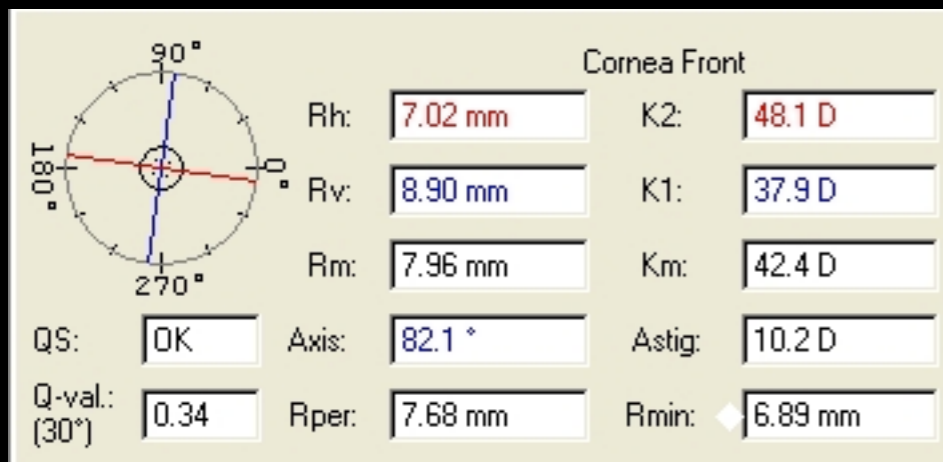
Given a Q value that fits
for both 210 and 320 ICRS,
How to choose between them?

Topographic Astigmatism $< 3,00$ D = **210**

Topographic Astigmatism $> 3,00$ D = **320**

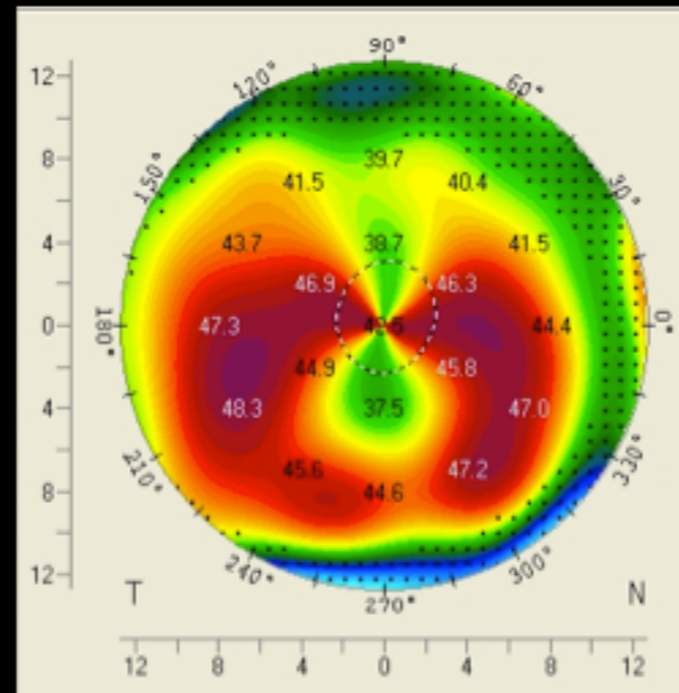
NOMOGRAM

Pellucid Marginal Degeneration



NOMOGRAM

Pellucid Marginal Degeneration



PMD = 140 RING

↙
Q = 0 or positive
oblate cornea

Topographic astigmatism

up to 4.00 D

4.00 – 8.00 D

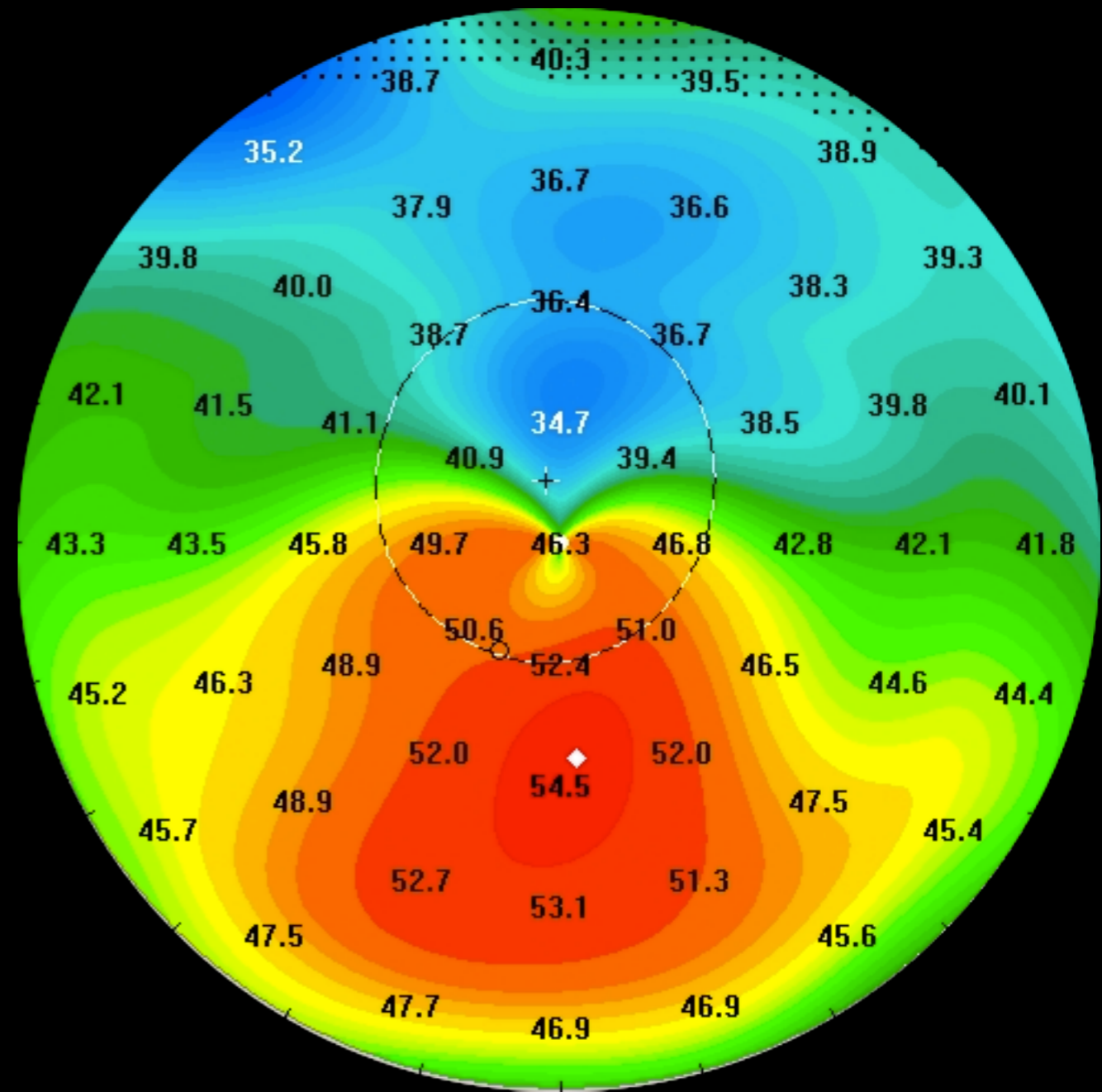
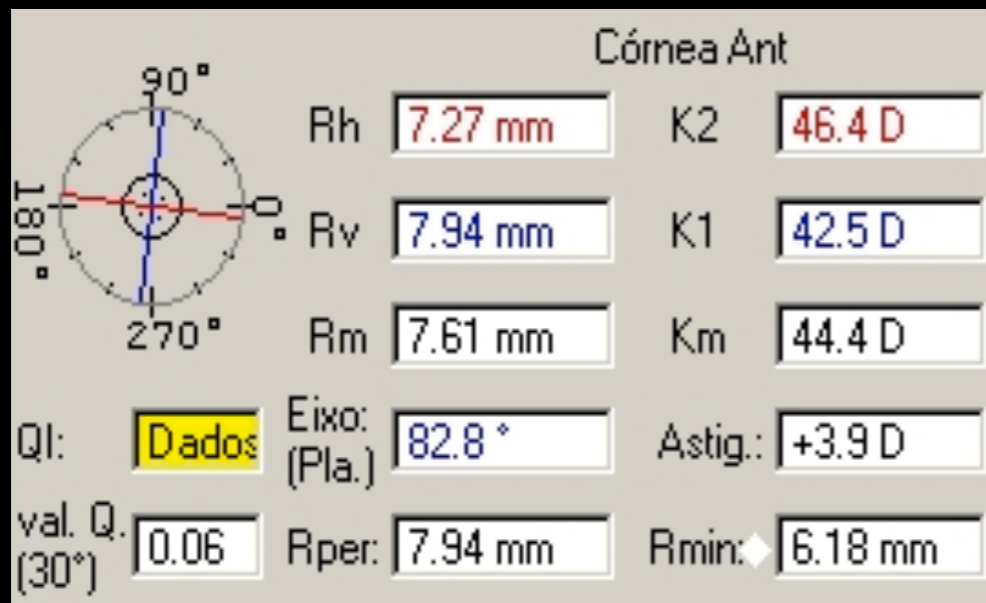
> 8.00 D

150 micra

200 micra

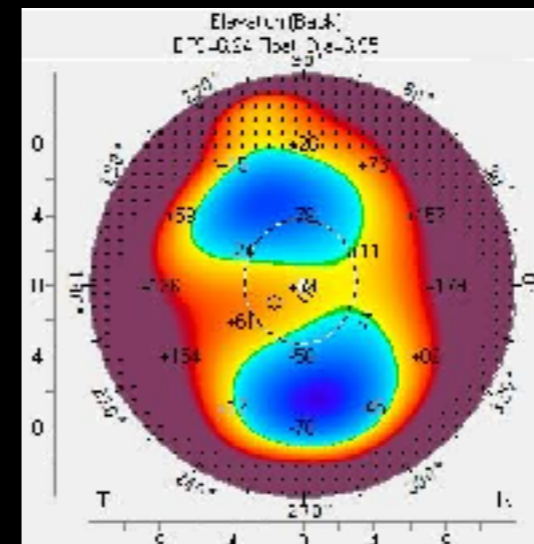
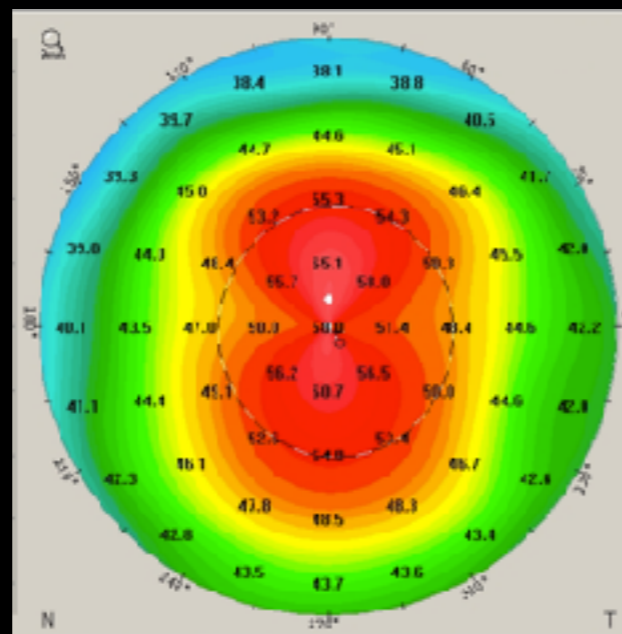
250 micra

DMP "like"



NOMOGRAM

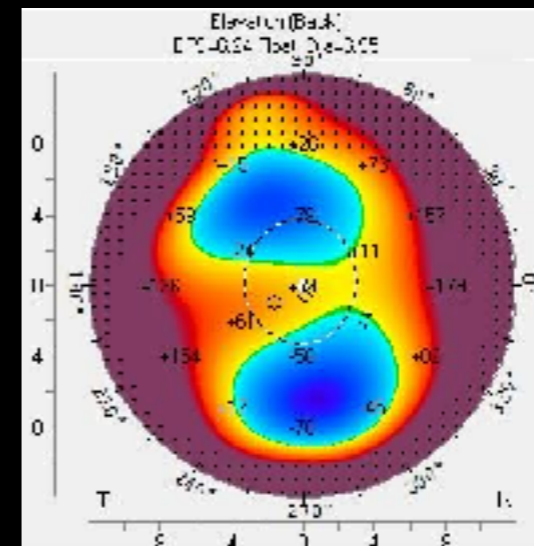
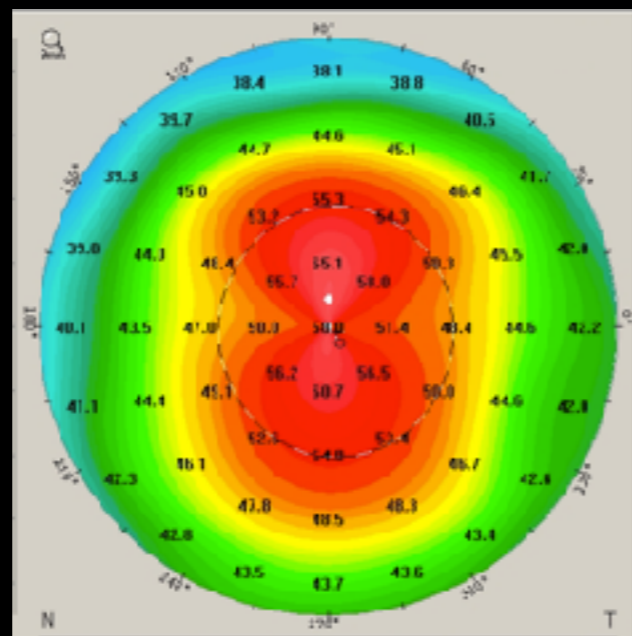
Astigmatic Keratoconus



Central location
Hiperprolate cornea ($Q \ll -1,3$)
High astigmatism
High keratometry
Posterior Elevation: Isthmus

NOMOGRAM

Astigmatic Keratoconus



ASTIGMATIC =
2 segments 140 ICRS
or
320 ICRS

ASTIGMATISM

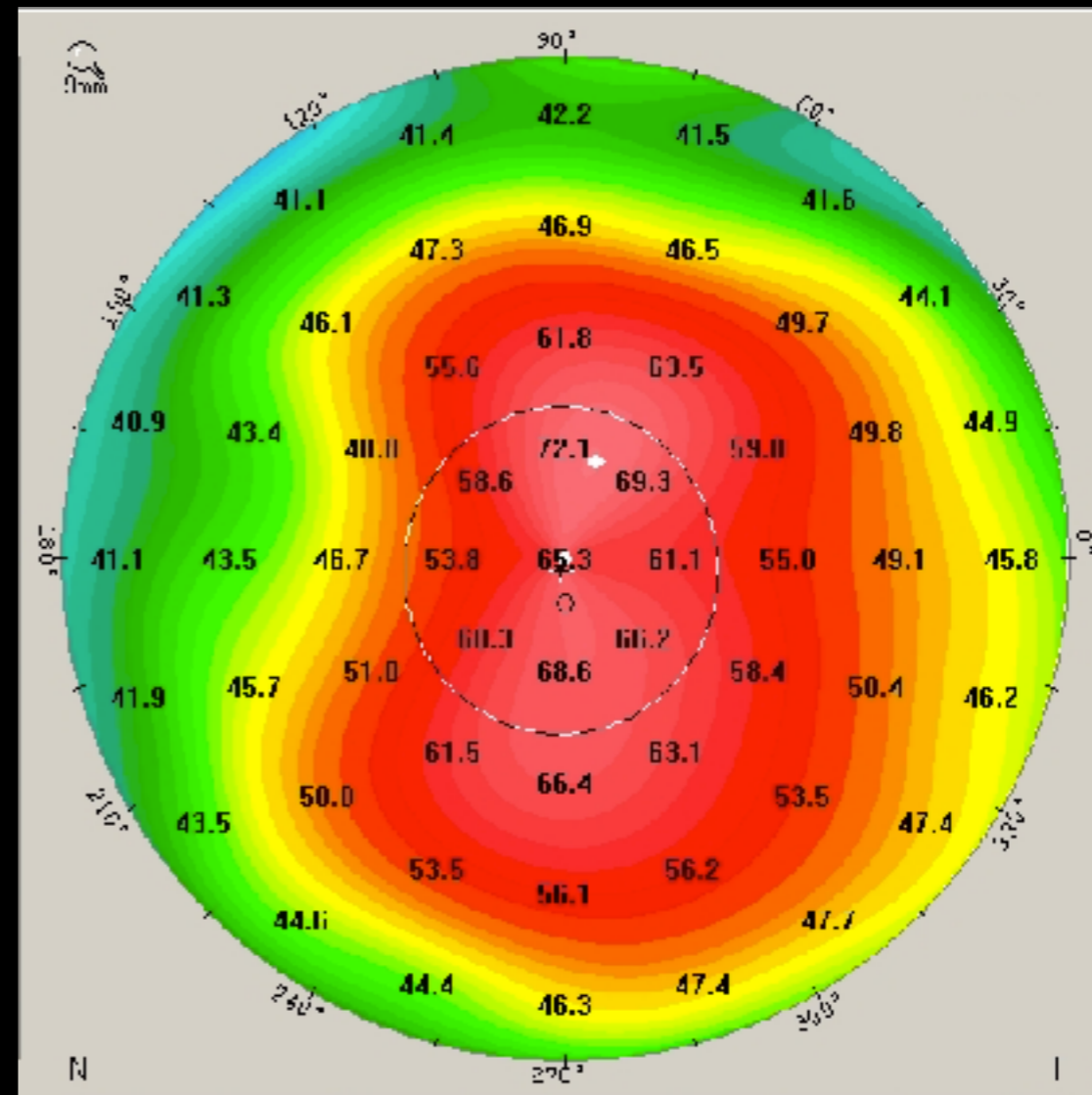
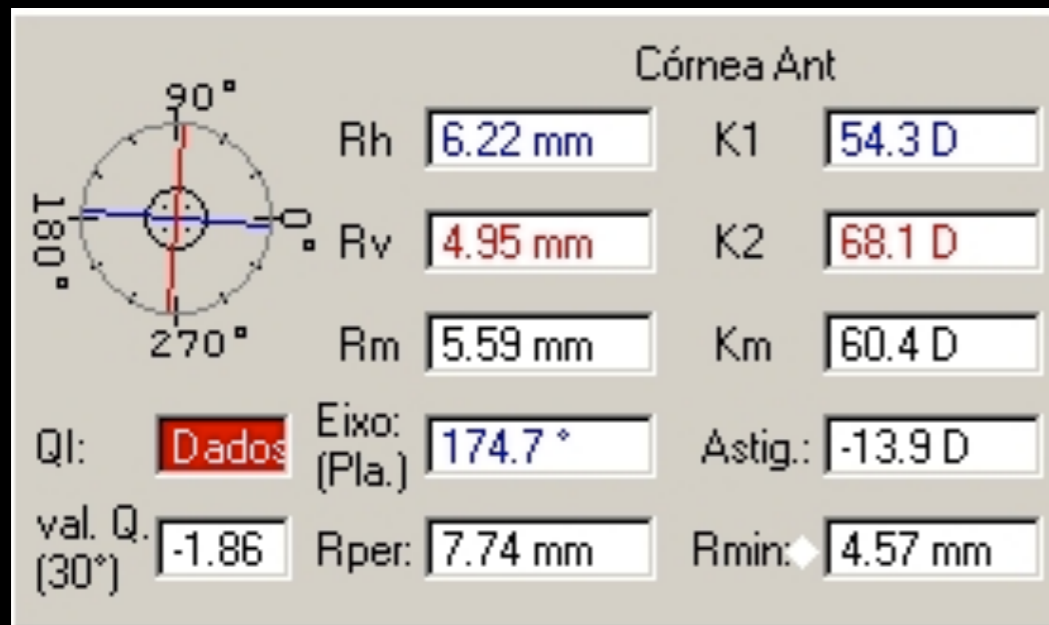
up to 6,00 D
 6,00 to 10,00 D
 > 10,00 D

ICRS

320/200
 2 x 140/200 or 320/250
 2 x 140/250 or 320/250

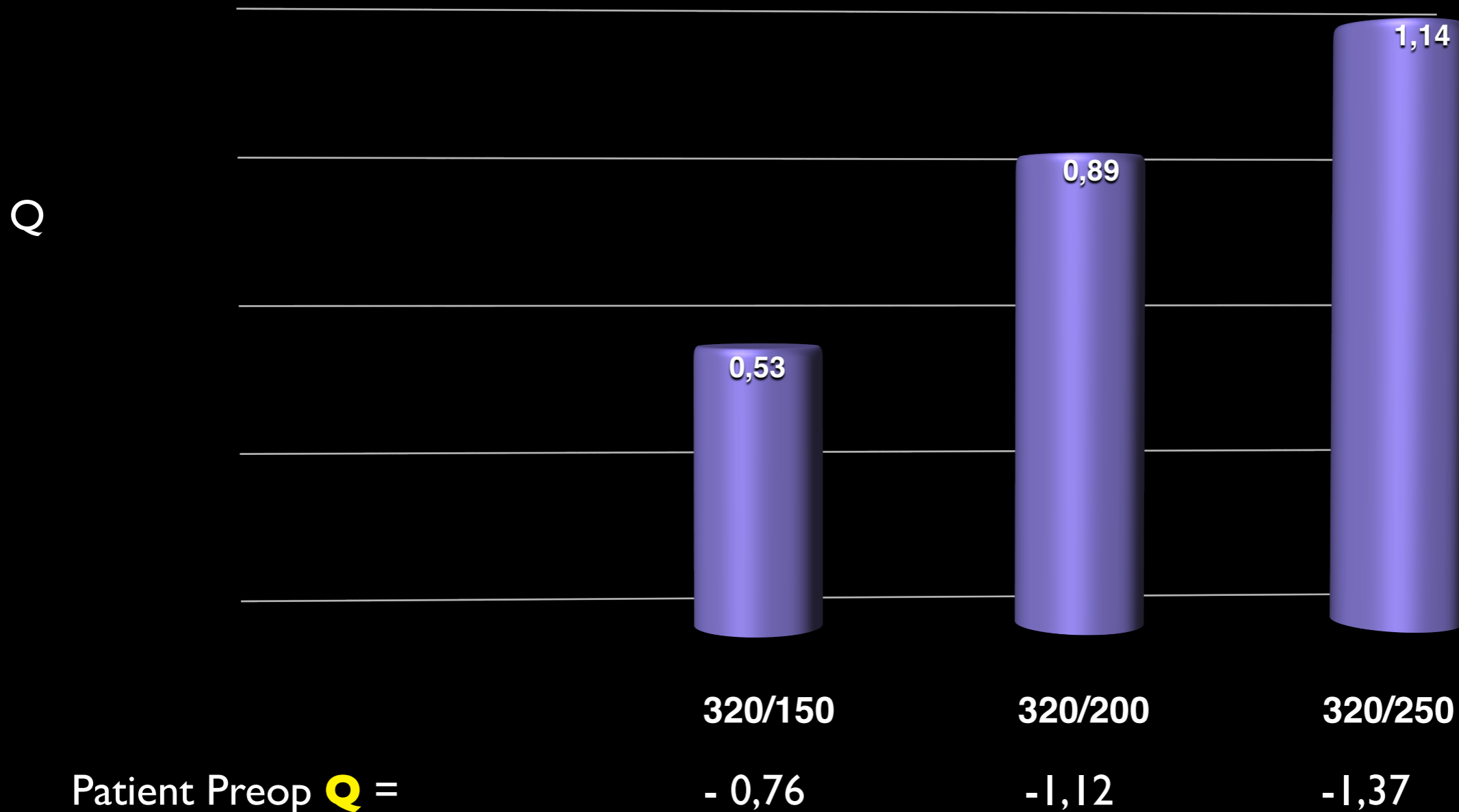
NOMOGRAM

Astigmatic Keratoconus



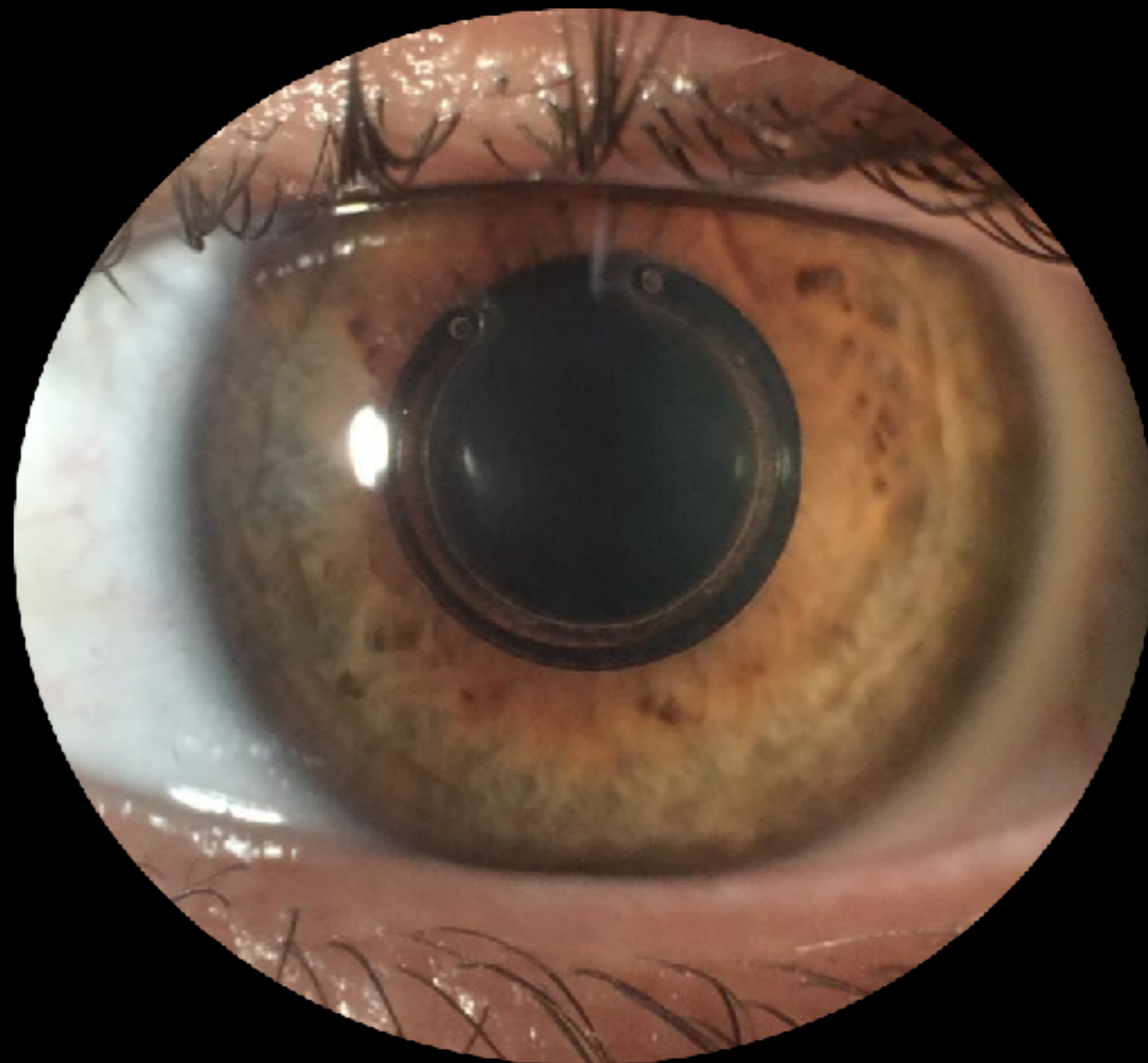
320 - ICRS

Q (asphericity) variation according to ring thickness



Patient Preop Q =

Advanced Cones The 320 ICRS



SURGICAL PLANNING: Step by Step

WHICH MAPS DO I NEED?

OCULUS - PENTACAM 4 Maps Refractive

Refractive

Cornea Front

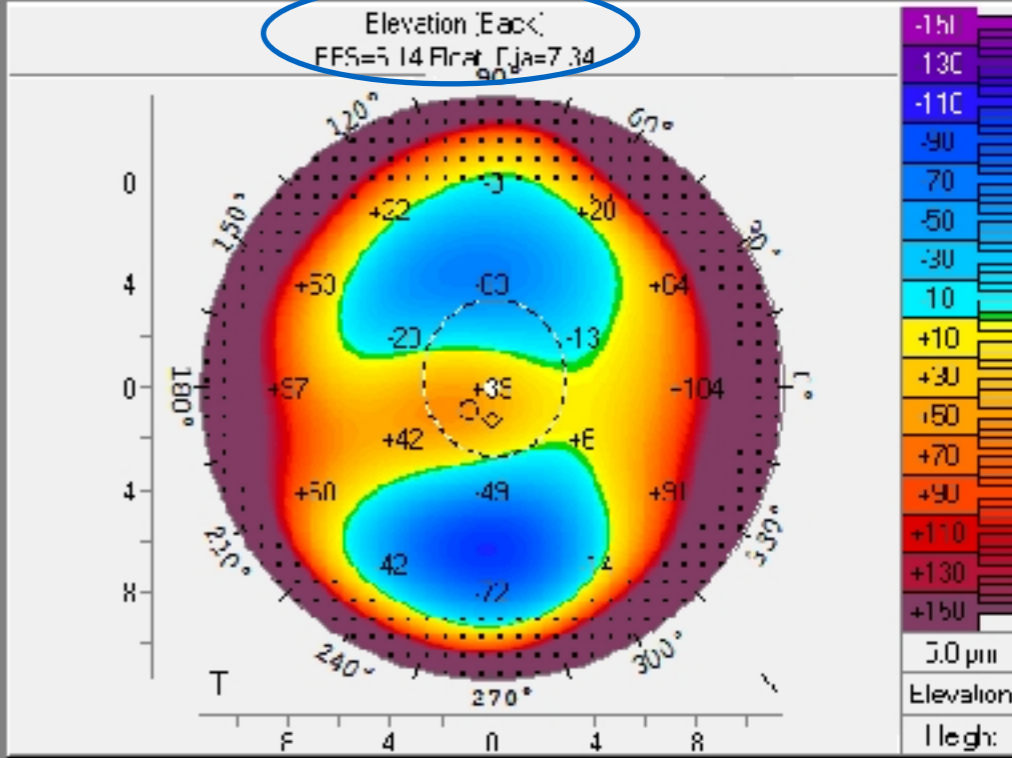
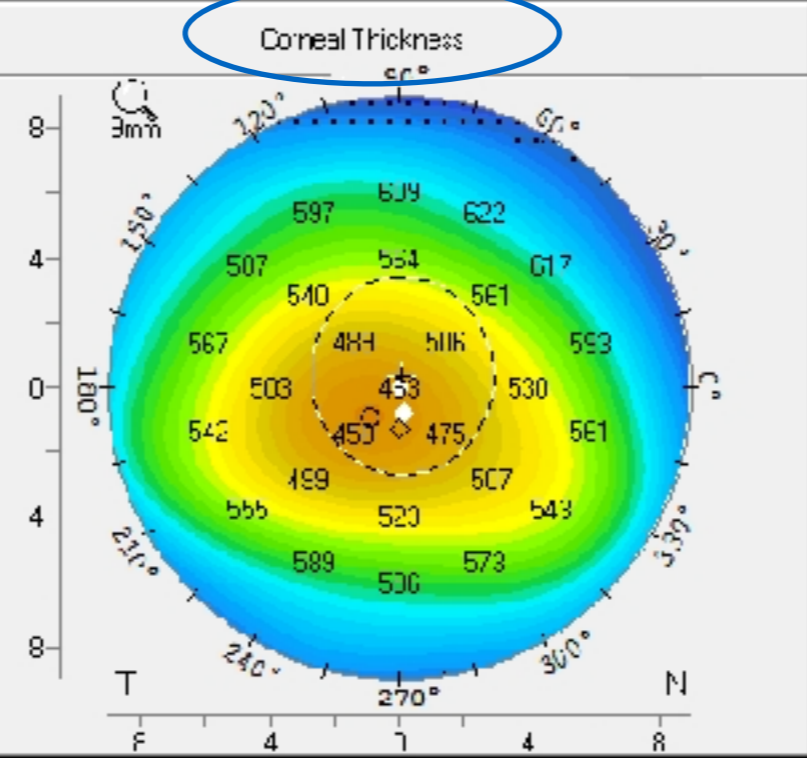
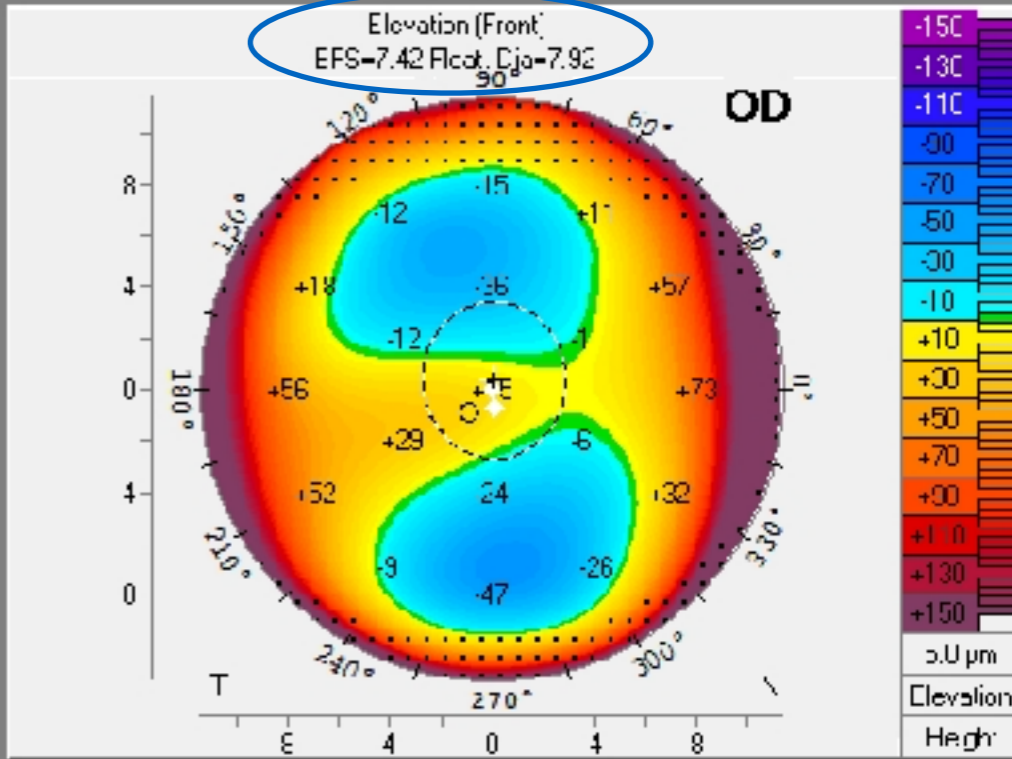
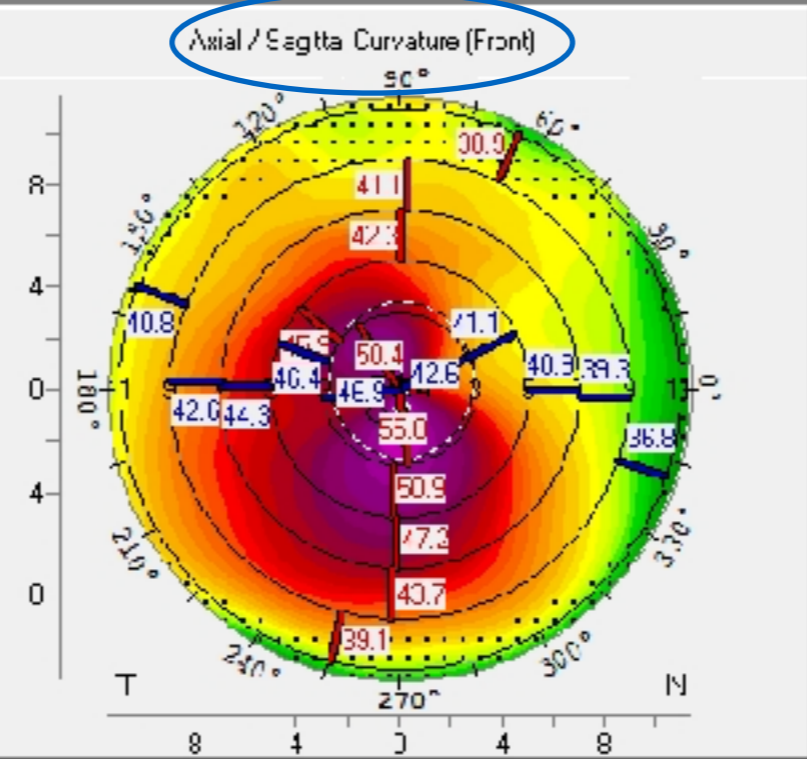
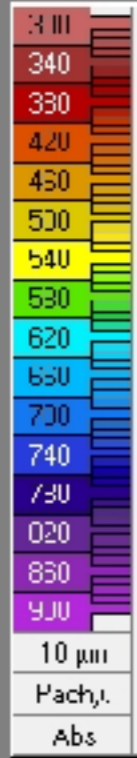
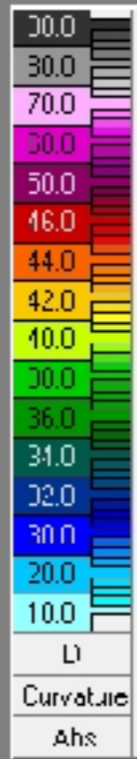
r1:	7.35 mm	K1:	44.7 D
r2:	6.40 mm	K2:	52.7 D
r3:	6.97 mm	Km:	48.4 D
Axis (ft.):	14.6°	Astiq.	8.0 D
Q val: (30°)	0.91	Rpar:	7.30 mm
		Rmin:	5.68 mm

Cornea Back

r1:	5.38 mm	K1:	-3.7 D
r2:	4.35 mm	K2:	-3.1 D
r3:	5.17 mm	Km:	-7.3 D
Axis (ft.):	8.3°	Astiq.	1.4 D
Q val: (30°)	-1.25	Rpar:	6.39 mm
		Rmin:	4.01 mm

Pupil Center:	400 μm	x (mm)	+0.04	y (mm)	+0.10
Pachy Apex:	463 μm		0.00		0.00
Thinnest Loc.:	454 μm		-0.44		-0.44
K Max. (ion):	50.4 D		+0.03		-0.00

Cornea Volume:	56.2 mm ³	Ø Cornea	12.2 mm
Chamber Volume:	19E mm ³	Angle:	33.6°
A. C. Depth (Int.):	3.38 mm	Pupil Dia:	2.93 mm
Enter IOP / IOP (cor):		Lens Th:	



SURGICAL PLANNING: Step by Step

FIRST STEP

DEFINE THE KERATOCONUS TYPE

(Axial and Elevation Maps)

SURGICAL PLANNING: Step by Step

SECOND STEP

DEFINE THE STEEPEST AXIS

SURGICAL PLANNING: Step by Step

THIRD STEP

DEFINE THE Q VALUE

SURGICAL PLANNING: Step by Step

FOURTH STEP

DEFINE THE TOPOGRAPHIC ASTIGMATISM

SURGICAL PLANNING: Step by Step

FIFTH STEP

SELECT THE ICRS TO BE IMPLANTED

according to

Q preoperative - Q change induced by the ring = - 0.23 (TARGET FINAL Q VALUE)

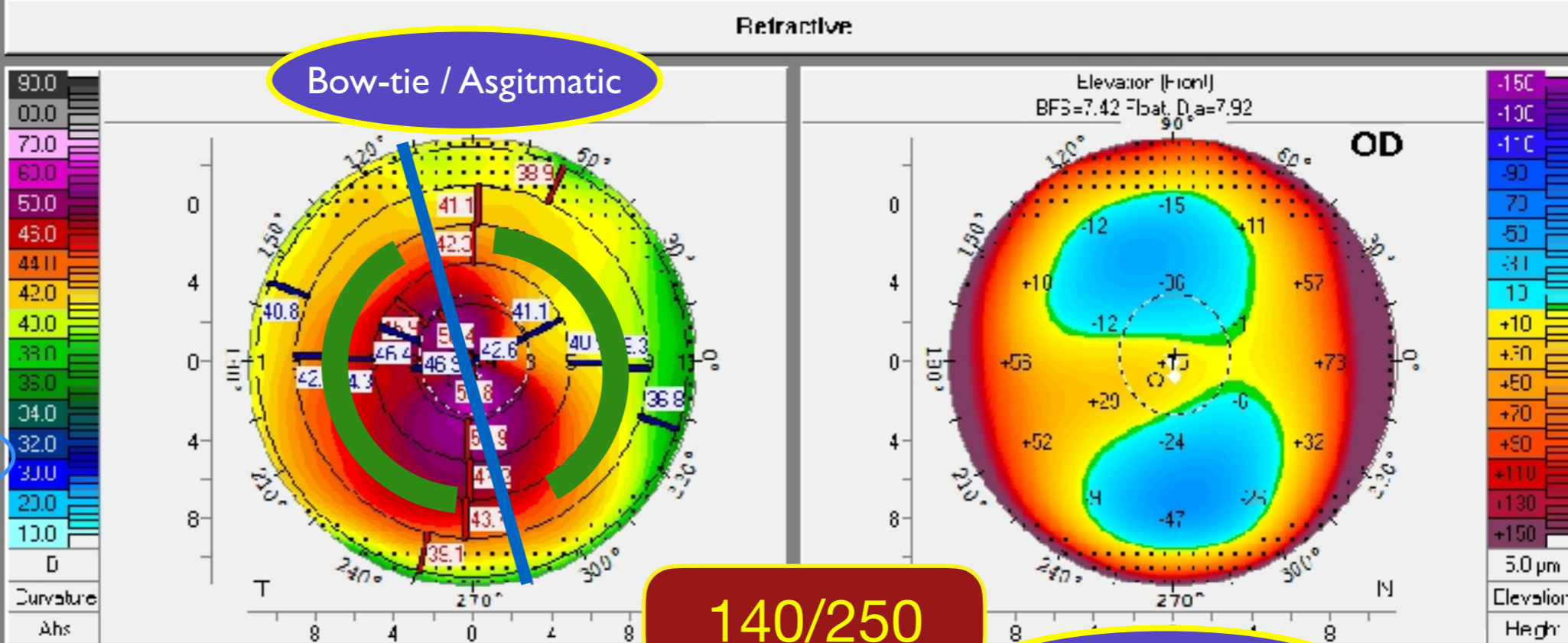
OCULUS - PENTACAM 4 Maps Refractive

Cornea Front			
Rh:	7.55 mm	K1:	44.7 D
Rv:	6.40 mm	K2:	52.7 D
Rm:	6.97 mm	Km:	48.4 D
OS:	OK	Axis:	14.6 °
Q-val. (30°)	-3.01	Astg:	3.0 D
Pcor:	7.90 mm	Pmin:	5.03 mm

Cornea Back			
Rh:	5.98 mm	K1:	-6.7 D
Rv:	4.95 mm	K2:	-0.1 D
Rm:	5.47 mm	Km:	-7.3 D
OS:	OK	Axis:	8.3 °
Q-val. (30°)	1.25	Astg:	1.4 D
Pcor:	6.69 mm	Pmin:	4.01 mm

	Pachy	x [mm]	y [mm]
Pupil Center:	469 μm	+0.04	+0.13
Pachy Apex:	463 μm	0.30	0.00
Thinest Local:	454 μm	-0.44	-0.44
K Max. (Front):	59.4 D	+0.06	-0.38

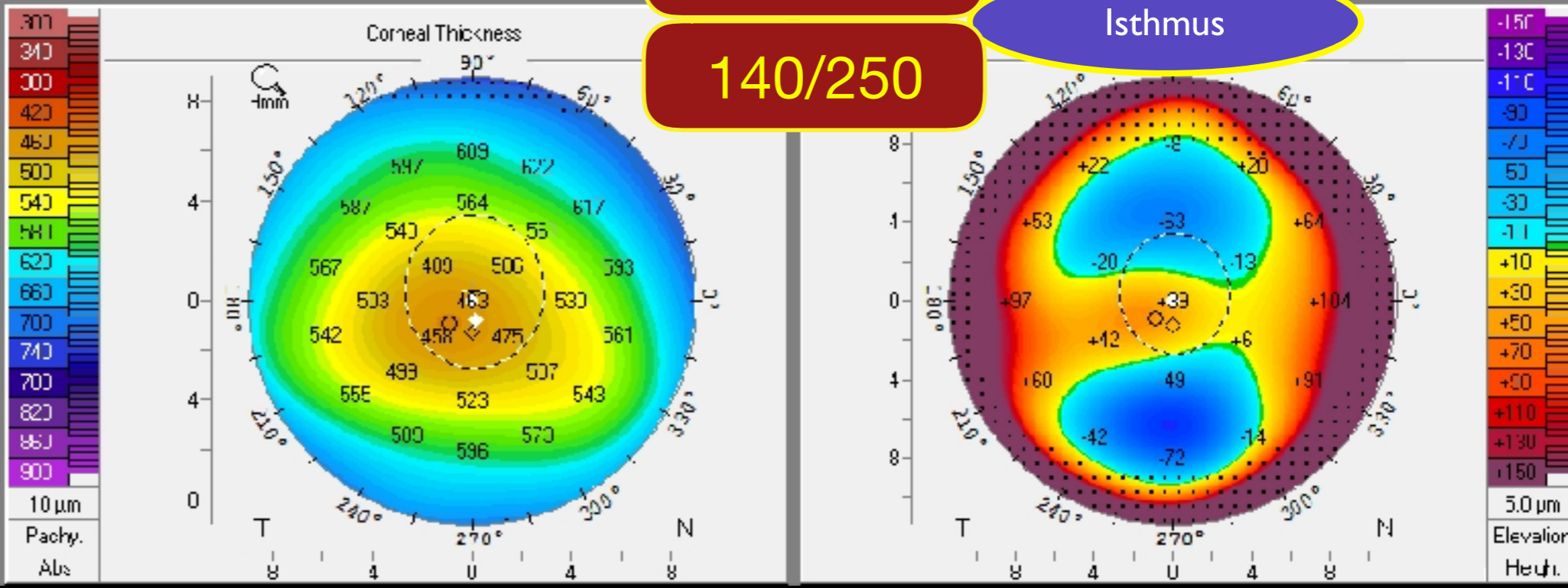
Cornea Volume:	55.2 mm ²	V Cornea:	12.2 mm
Chorioid Volume:	196 mm ²	Angle:	38.6 °
A. C. Depth (Int.):	3.58 mm	Fupil Dia:	2.95 mm
Enter IOP	IOP (cont)	Lens Th	



140/250

140/250

Isthmus



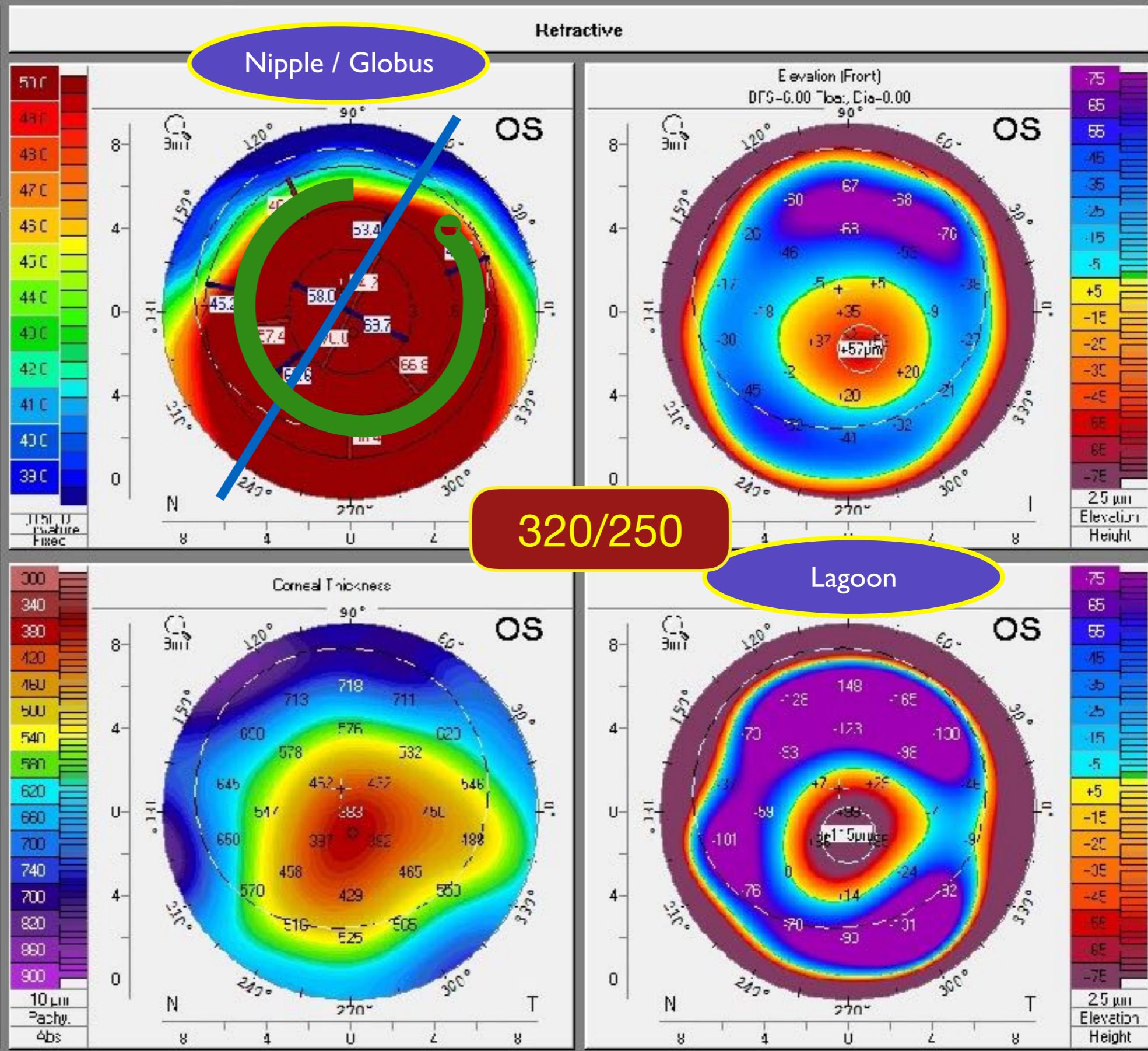
OCULUS - PENTACAM 4 Maps Refractive

Cornea Front			
Rt:	5.37 mm	K1:	62.9 D
Rx:	5.11 mm	K2:	66.1 D
Rm:	5.24 mm	Kr:	64.4 D
Axis: (sleep)	64.2°	Astig:	3.2 D
G-val: (8mm)	2.34	Fper:	7.48 mm
Fmin:	4.73 mm		

Cornea Back			
Pt:	3.70 mm	K1:	-13.0 D
Rx:	3.73 mm	K2:	-17.7 D
Pm:	3.70 mm	Kr:	-13.0 D
Axis: (sleep)	117.0°	Astig:	0.2 D
G-val: (8mm)	-2.14	Fper:	6.70 mm
Fmin:	3.10 mm		

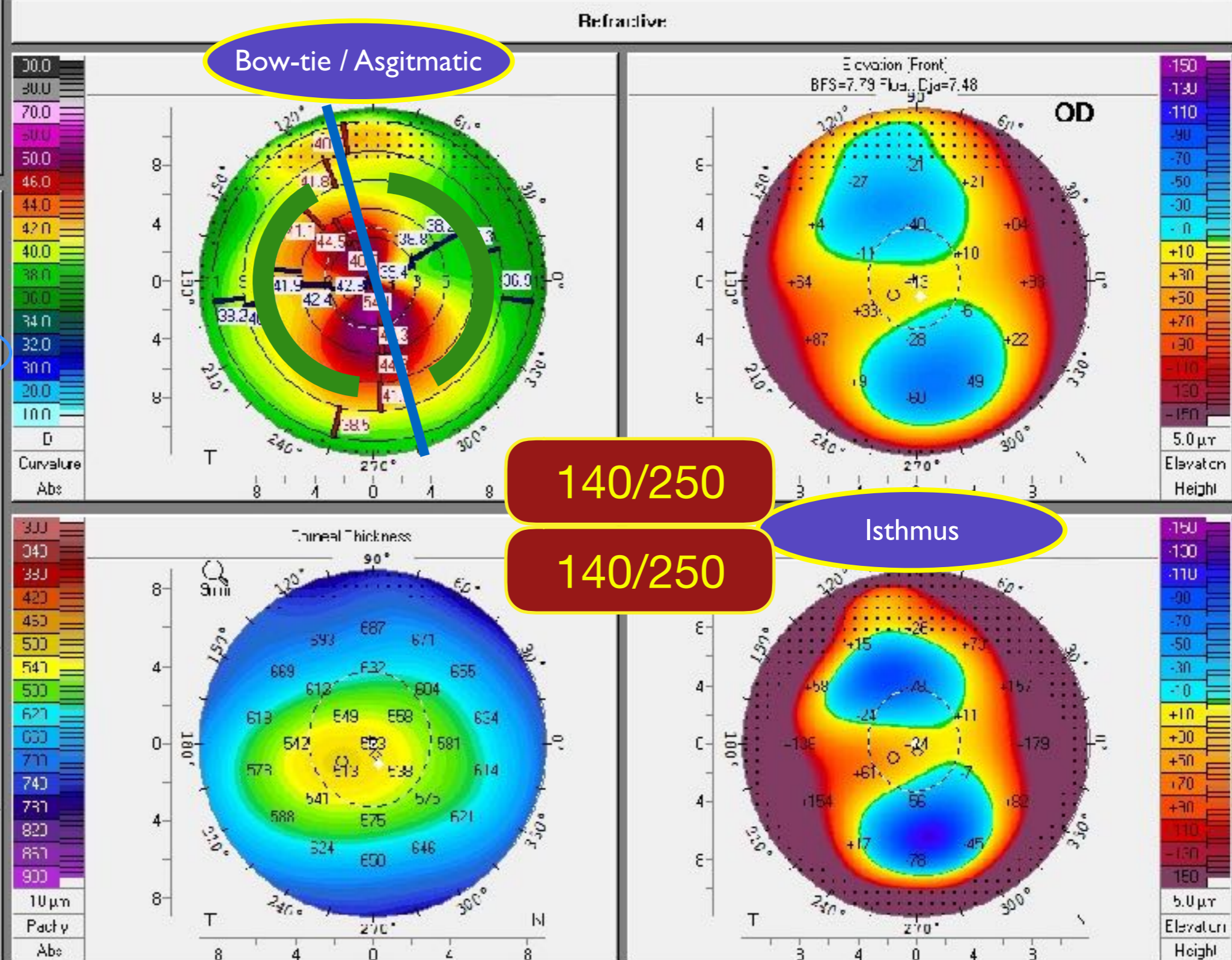
Pachy			
Fupl Center:	+ 422 μm	Δr mi:	-0.22
Fach Apex:	383 μm	Δr mi:	0.00
Thinnest Loc:	372 μm	Δr mi:	+0.05
K Max. (Front):	71.4 D	Δr mi:	-1.00

Cornea Volume:	603 mm ³	Ø Cornea:	12.1 mm
Chamber Volume:	211 mm ³	Angle:	46.8°
A. L. Depth (Int.):	4.13 mm	Pupil Dia:	6.86 mm
Enter IOP (IOPCum):	+6.7 mmHg	Lens Th.:	3.1 mm



OCULUS - PENTACAM 4 Maps Refractive

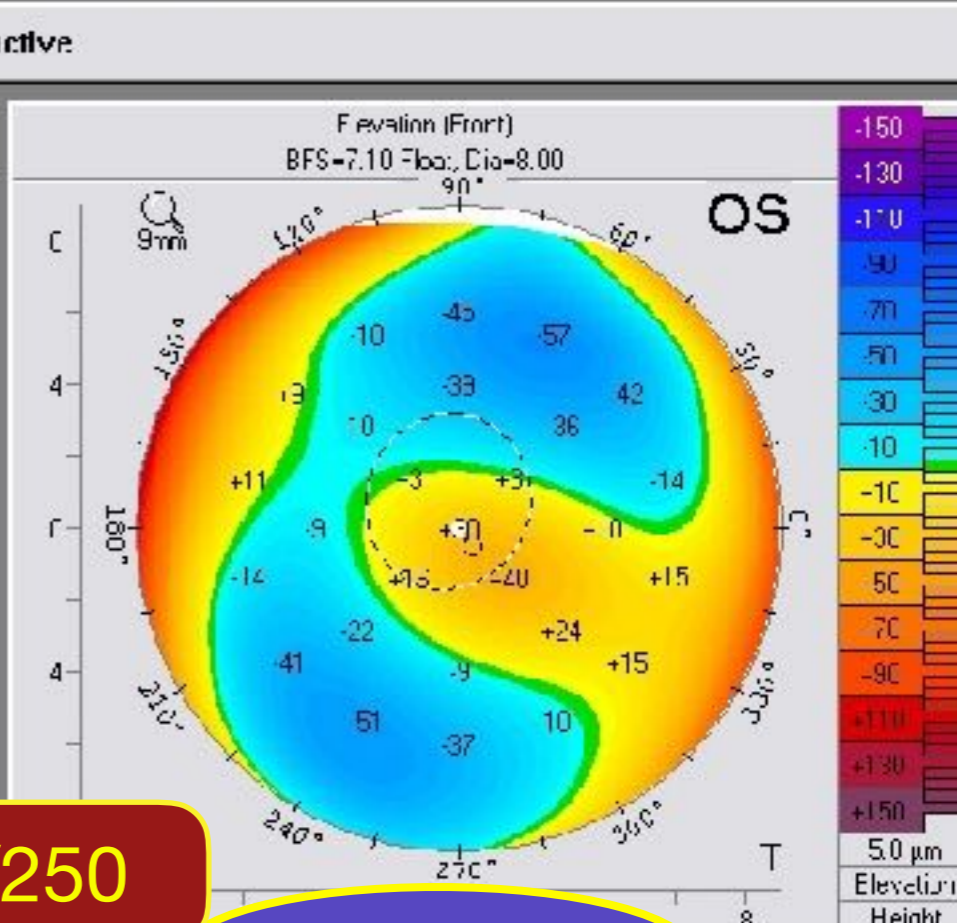
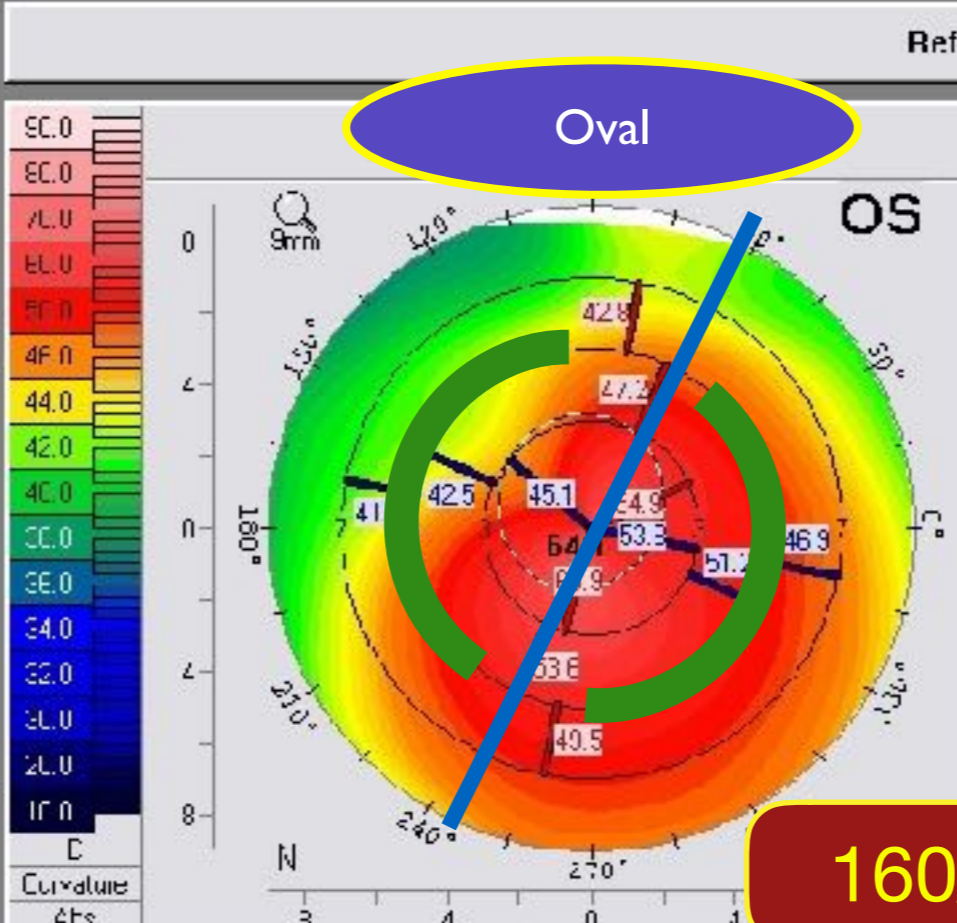
Cornea Front			
Rht	8.22 mm	K1:	41.1 D
Rv.	6.56 mm	K2:	51.3 D
Rm.	7.40 mm	Km:	45.6 D
JS:	OK	$\Delta_{x,s}$ (ft.)	15.5°
Q-val:	-3.00	Fper:	0.00 mm
3L:	30°	Tmin:	0.00 mm
Astig: 10.3 D			
Cornea Back			
Rht	6.75 mm	K1:	5.9 D
Rv.	4.90 mm	K2:	8.2 D
Rm.	5.82 mm	Km:	6.9 D
JS:	OK	$\Delta_{x,s}$ (ft.)	14.9°
Q-val:	-1.18	Fper:	7.04 mm
3L:	30°	Tmin:	1.23 mm
Astig: 2.2 D			
Pachy: +		x(mm)	y(mm)
Pupil Center.	524 μ m	-0.03	+0.11
Pachy Apex:	523 μ m	0.00	0.00
Thinnest Loca...:	511 μ m	-0.83	-3.47
< Max. (Front):	565 D	+0.13	-1.53
Cornea Volume:	603 mm ³	\emptyset Cornea:	13.1 mm
Chamber Volume:	187 mm ³	Angle:	38.6°
A-C Depth (r.t.):	3.44 mm	Pupil Dia:	3.32 mm
Enter IOP	IOP(co):	Lens Th.:	



Cornea Front			
Rf:	6.77 mm	K1:	19.3 D
Rs:	5.92 mm	K2:	57.0 D
Rm:	6.35 mm	Km:	53.2 D
Axis (fla.):	151.9°	Astg:	-7.1 D
Rpot:	7.80 mm	Rmin:	5.25 mm
C-val: (9nm)	-0.23		

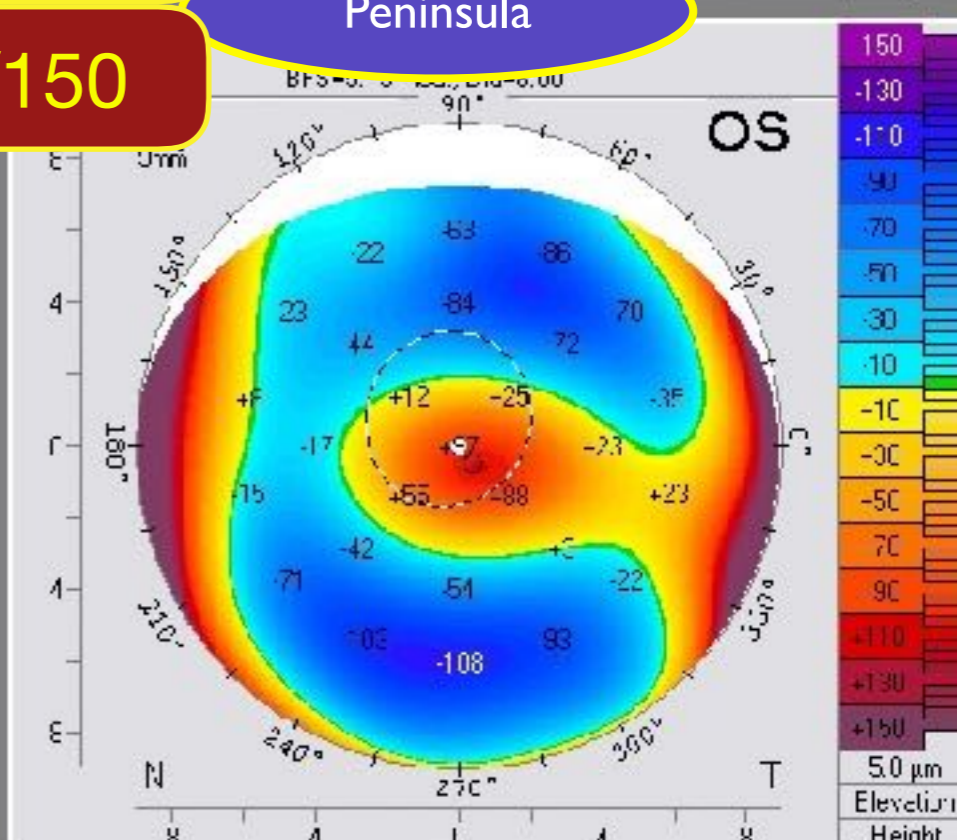
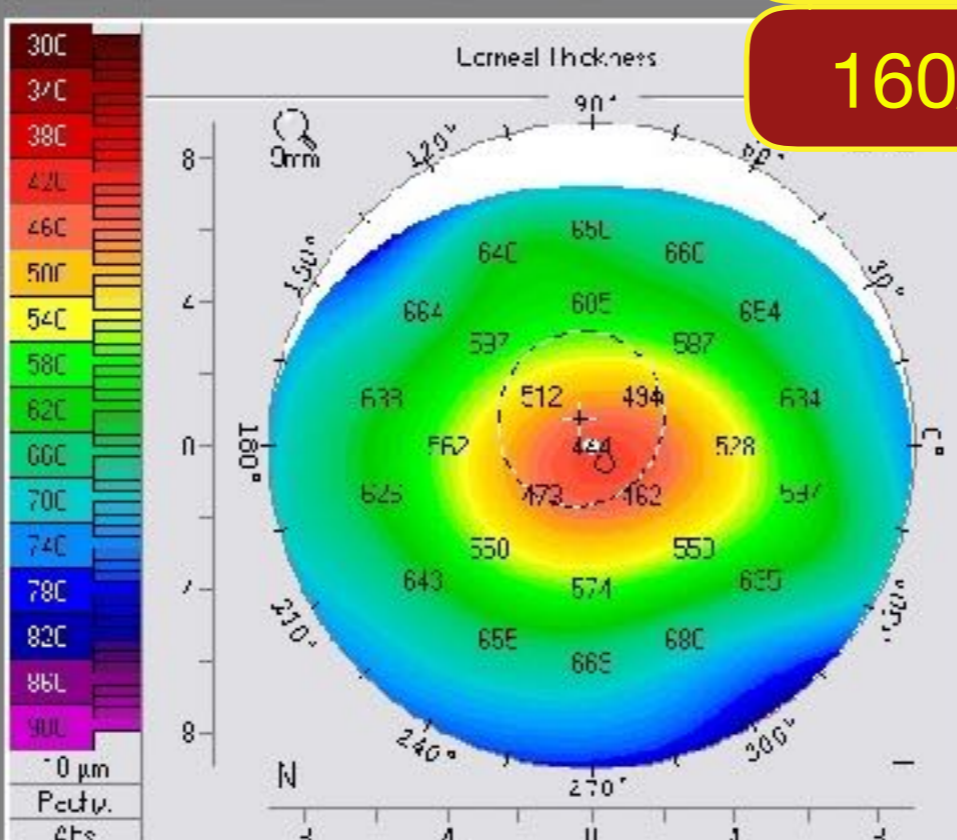
Cornea Back			
Rf:	4.87 mm	K1:	8.3 D
Rs:	4.19 mm	K2:	9.6 D
Rm:	4.50 mm	Km:	8.9 D
Axis (fla.):	167.8°	Astg:	+2.0 D
Rpot:	6.38 mm	Rmin:	2.97 mm
C-val: (9nm)	-0.42		

Fupil Center:			
+	166 μm	x [mm]	-0.16
		y [mm]	+0.37
Fovea Apex:			
•	444 μm	x [mm]	0.00
		y [mm]	0.00
Thinnest Locat.:			
○	400 μm	x [mm]	+0.20
		y [mm]	-0.27
K Max. (Tan):			
•	64.7 D	x [mm]	-0.20
		y [mm]	-0.50
Cornea Volume:			
	62.6 mm ³	<P>	4.5 D
Charles Volume:			
	170 mm ³	Angle:	32.7°
A.C. Depth (Ext.):			
	3.77 mm	Supi Dia:	2.37 mm
Enter IOP (IOP(Cum)):			
	+7.2 mmHg	Lens Th:	



160/250

160/150



OCULUS - PENTACAM 4 Maps Selectable

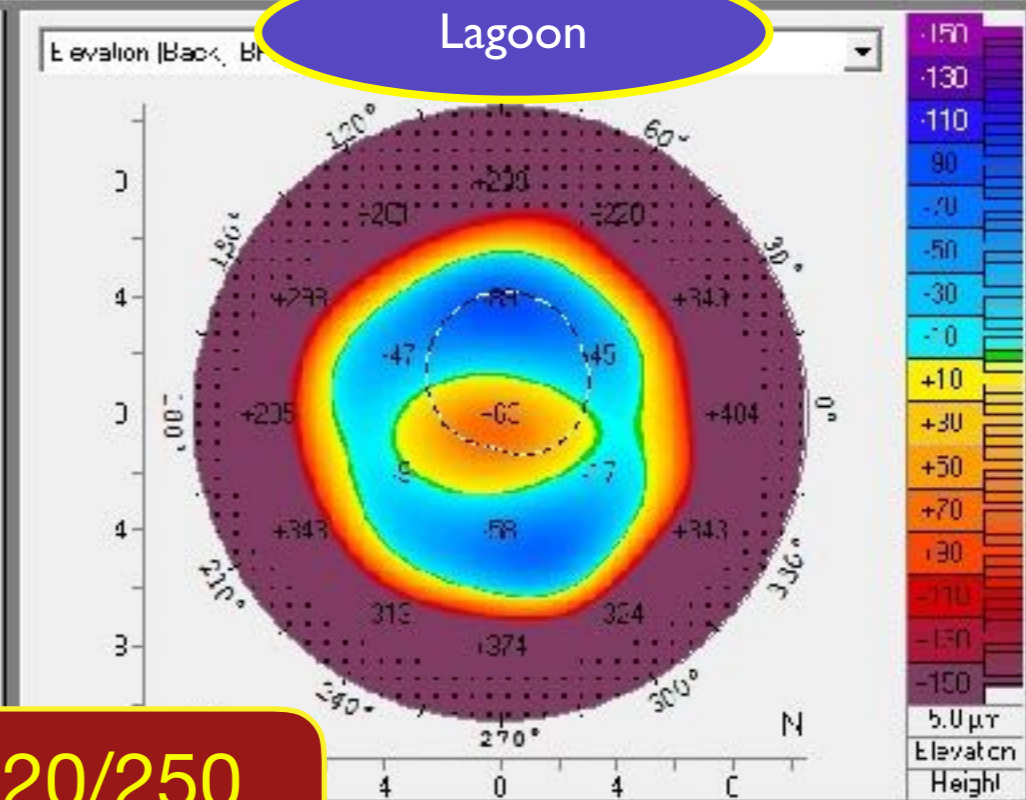
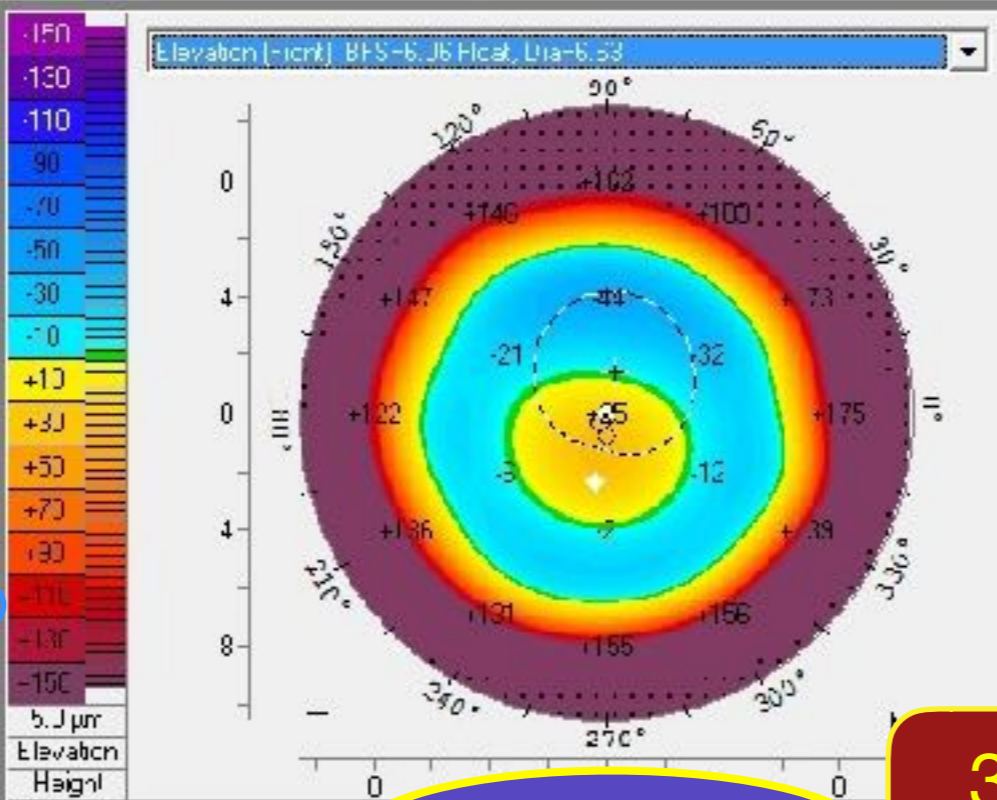
Cornea Front

Rht	5.46 mm	K1:	67.8 D
Rv.	5.44 mm	K2:	62.0 D
Rm.	5.45 mm	Km:	67.9 D
AS:	OK	Δ_{Ks} (Alt.)	173.3°
Q-val:	-2.01	Γ_{per}	7.07 mm
3L:	30°	Astig:	0.2 D
		rmin:	4.73 mm

Cornea Back

Rht	4.30 mm	K1:	92.0 D
Rv.	4.13 mm	K2:	97.0 D
Rm.	4.23 mm	Km:	95.0 D
AS:	OK	Δ_{Ks} (Alt.)	25°
Q-val:	-2.16	Γ_{per}	6.61 mm
3L:	30°	Astig:	0.5 D
		rmin:	2.75 mm

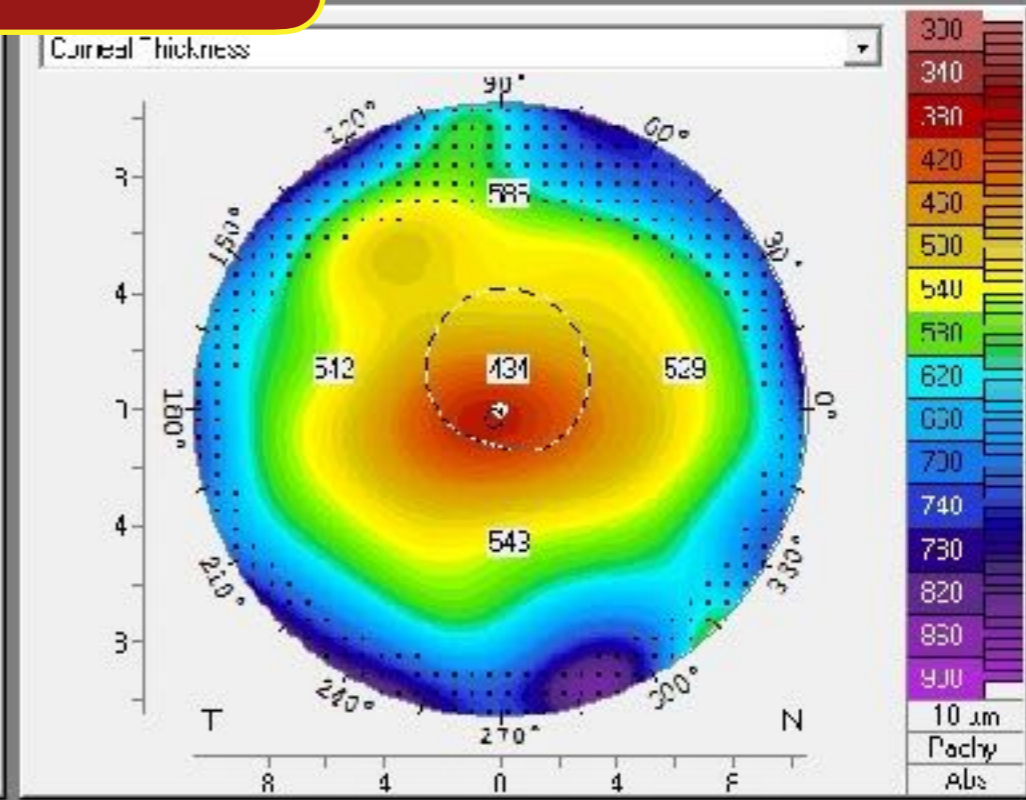
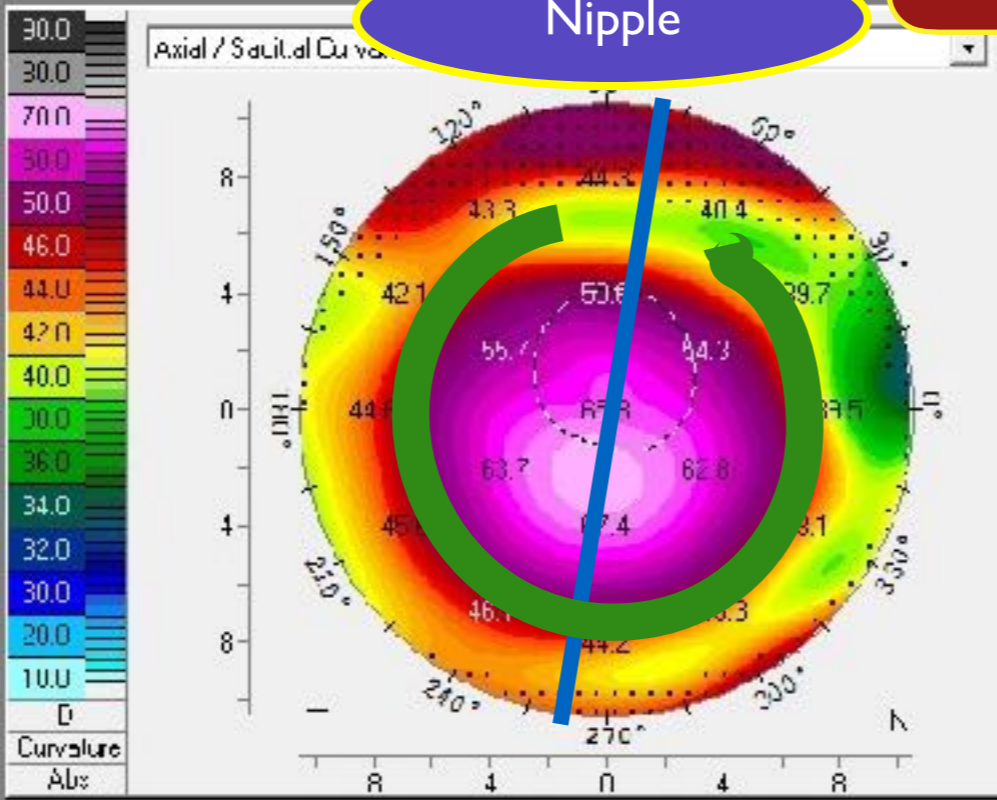
Pachy:	x[mm]	y[mm]	
Pupil Center:	+ 434 μ m	+0.15	+0.71
Pachy Apex:	393 μ m	L.U.U	U.U.U
Thinnest Loca...:	387 μ m	-0.12	-3.18
< Max. (Front):	704 μ m	-0.13	-1.17
Cornea Volume:	54.4 mm ³	\emptyset Cornea:	12.2 mm
Chamber Volume:	153 mm ³	Angle:	36.4°
A.C. Depth (r.t.):	3.41 mm	Pupil Dia:	2.80 mm
Enter 10 ⁻³ IOP (cor):		Lens Th.:	



Lagoon

320/250

Nipple

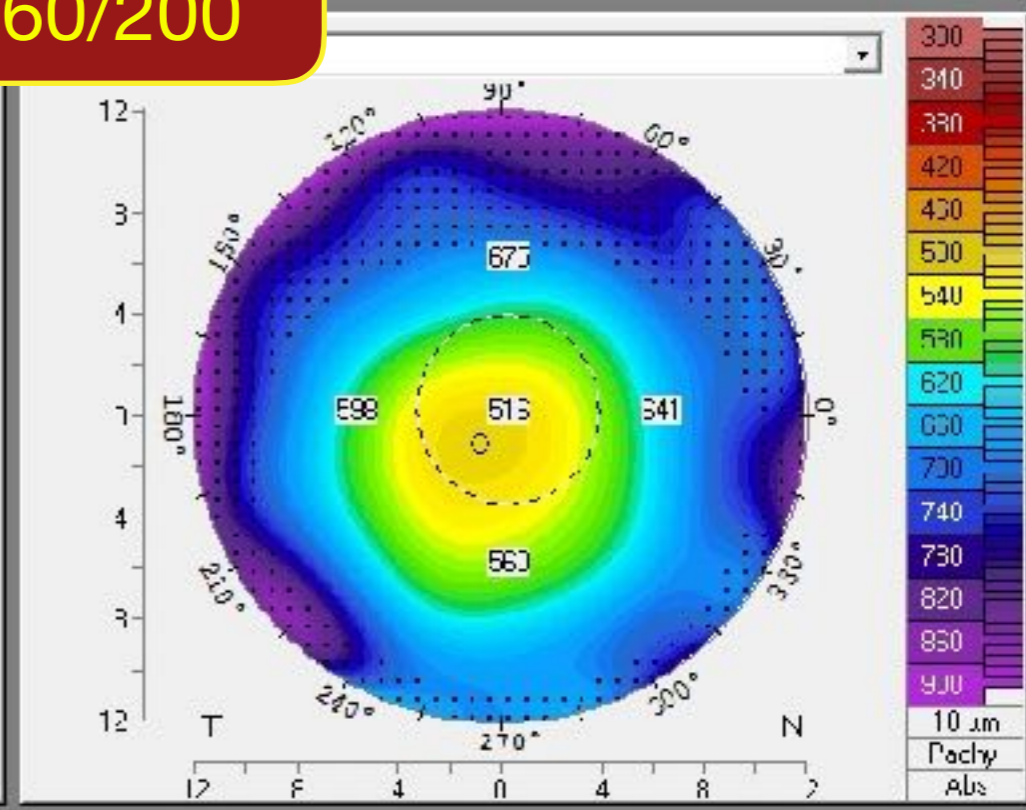
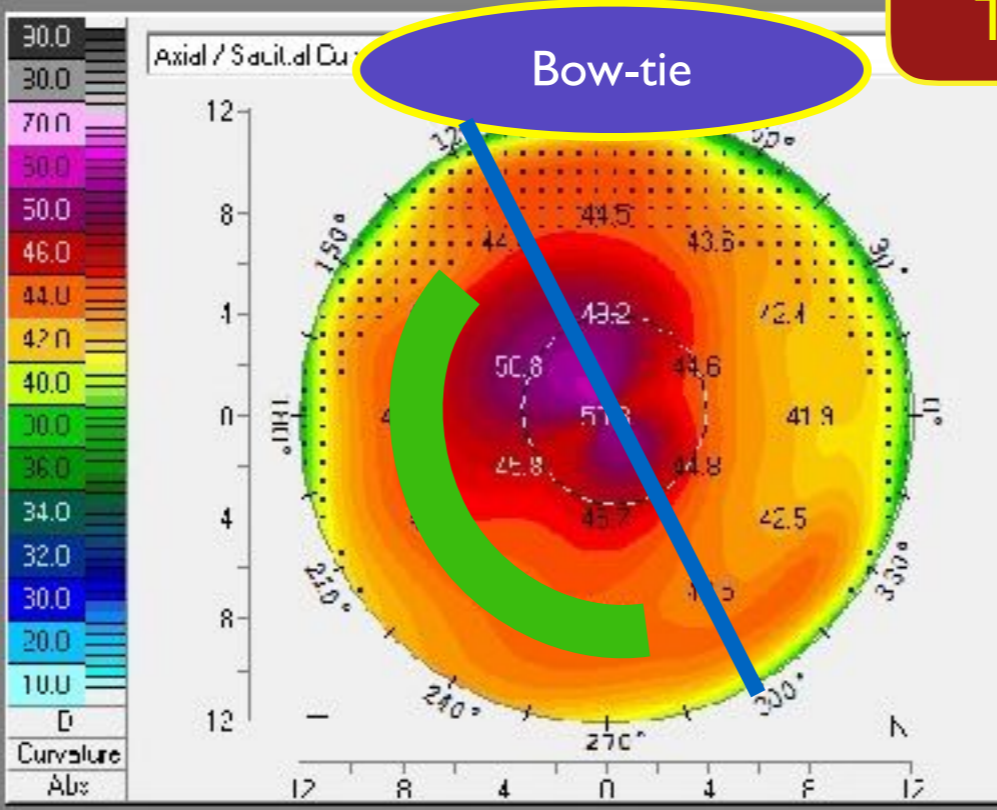
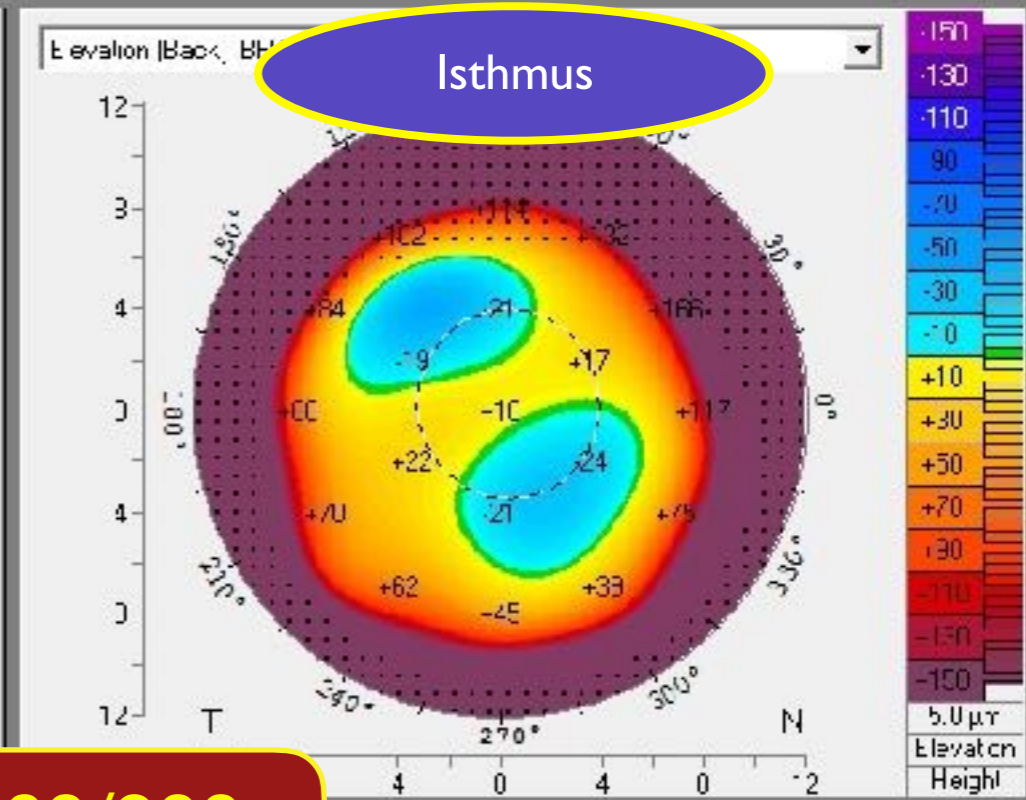
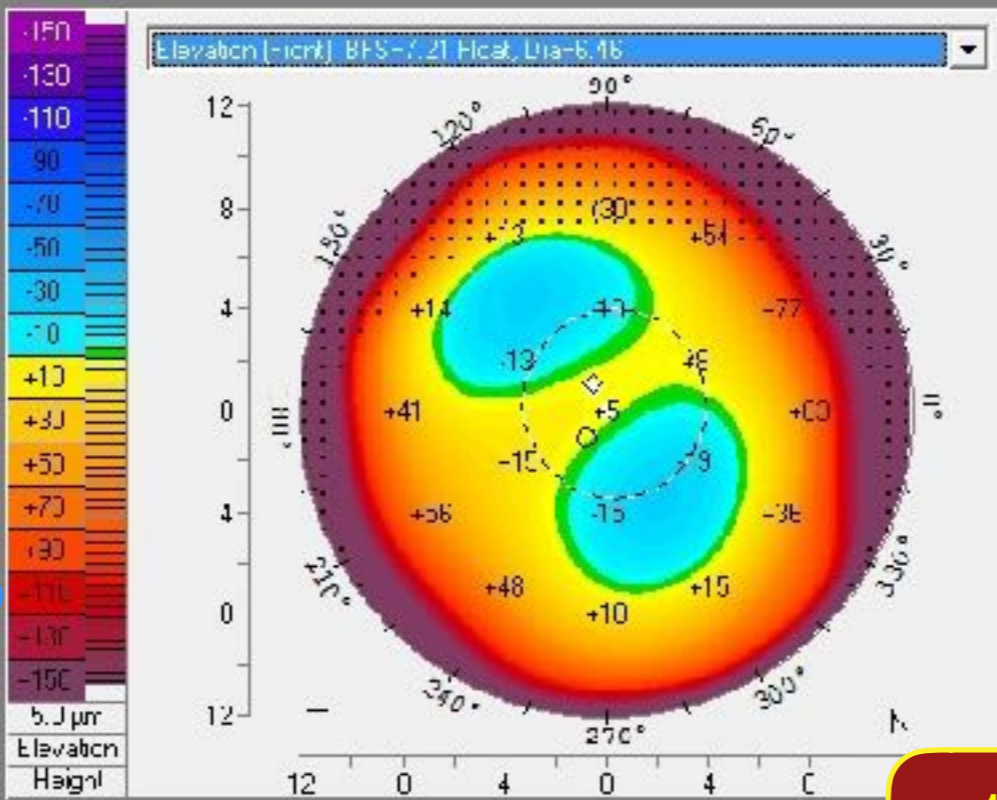


OCULUS - PENTACAM 4 Maps Selectable

Cornea Front			
Rht	7.35 mm	K1:	45.7 D
Rv.	6.66 mm	K2:	50.7 D
Rm.	7.03 mm	Km:	48.0 D
AS:	OK	Δ_{axis} (ft.)	32.1°
Q-val:	-3.06	Astiq:	5.0 D
3L:	30°	Fper:	7.74 mm
		rmin:	5.94 mm

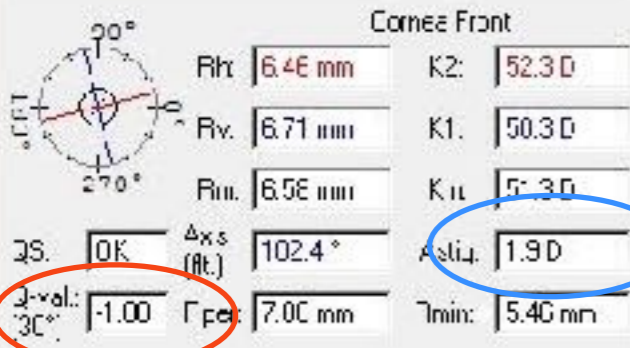
Cornea Back			
Rht	6.01 mm	K1:	-0.7 D
Rv.	5.26 mm	K2:	7.6 D
Rm.	5.63 mm	Km:	7.7 D
AS:	OK	Δ_{axis} (ft.)	28.9°
Q-val:	-3.98	Astiq:	0.9 D
3L:	30°	Fper:	6.53 mm
		rmin:	1.57 mm

Pachy			
Pupil Center	+ 513 μ m	x(mm)	+0.16
		y(mm)	+0.13
Pachy Apex	512 μ m	x(mm)	0.00
		y(mm)	0.00
Thinnest Loc...	507 μ m	x(mm)	-0.43
		y(mm)	-3.54
Max. (Front)	55.8 D	x(mm)	-0.27
		y(mm)	+0.77
Cornea Volume	592 mm ³	KPD	-1.7 D
Chamber Volume	192 mm ³	Angle	38.0°
A-C Depth (r.t.)	3.33 mm	Pupil Dia.	3.65 mm
Enter IOP	IOP(co):	Lens Th.:	



160/200

OCULUS - PENTACAM 4 Maps Selectable



Cornea Front

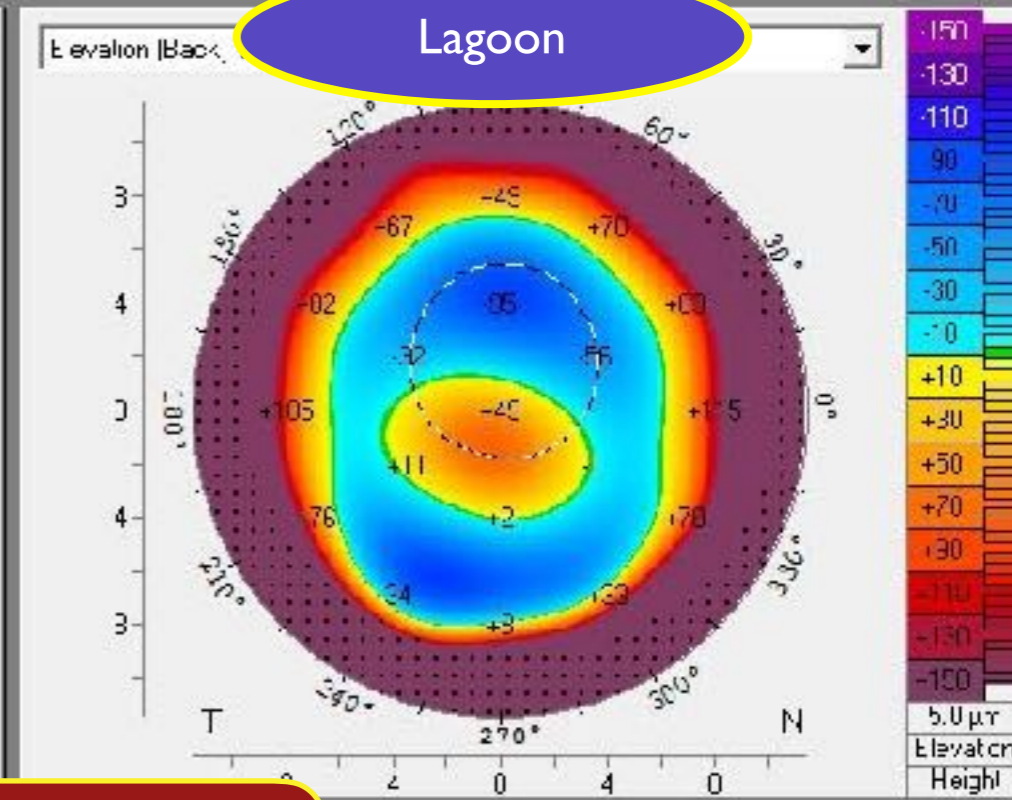
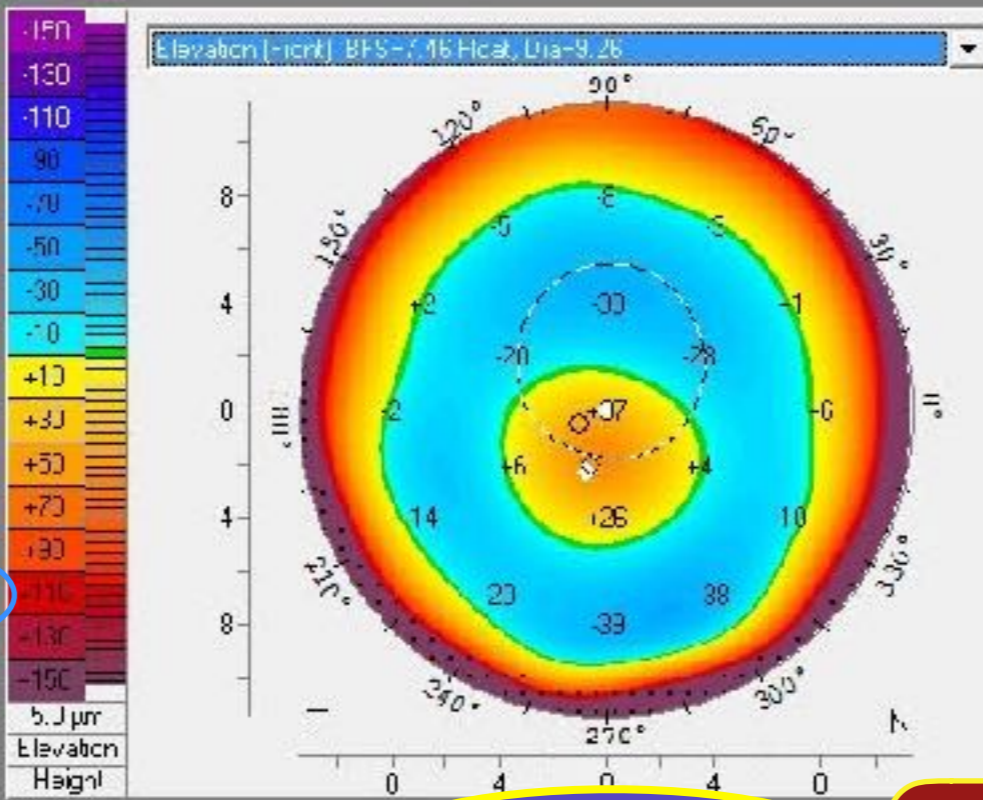
Rht	6.46 mm	K2	52.3 D
Rv	6.71 mm	K1	50.3 D
Rm	6.56 mm	Km	51.3 D
JS	OK	Δ_{xys} (ft.)	102.4°
J-val: 3C°	-1.00	Fper	7.00 mm
		rmin	5.40 mm
Astig		1.9 D	

Cornea Back

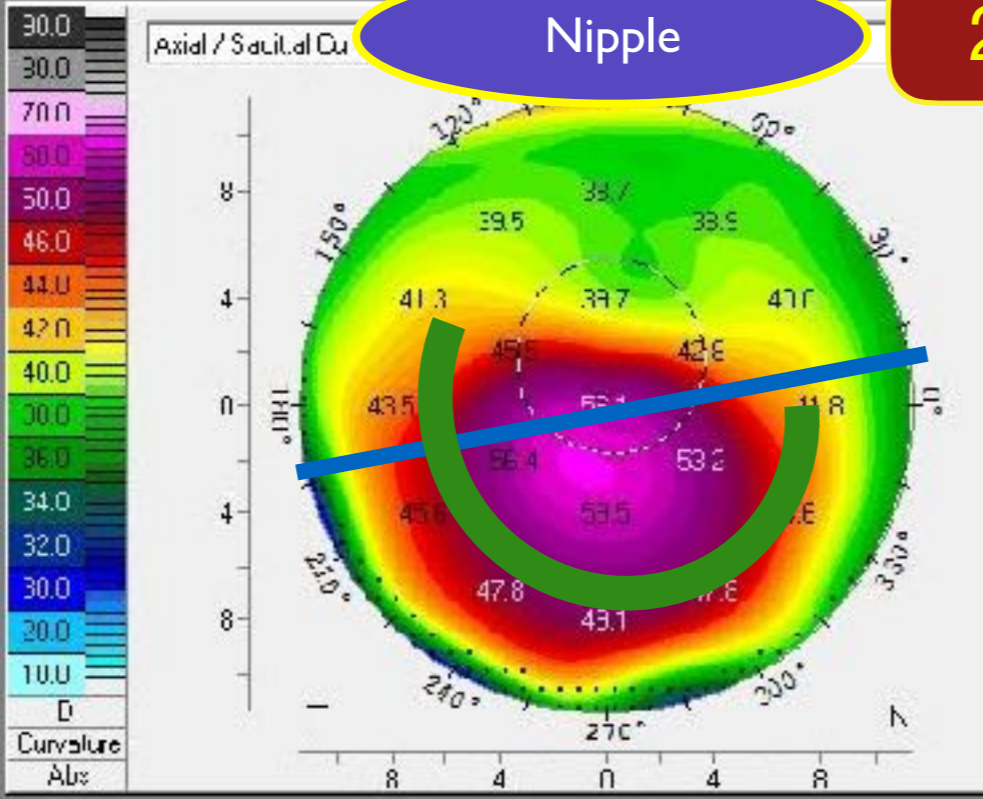
Rht	5.10 mm	K2	7.0 D
Rv	5.01 mm	K1	8.0 D
Rm	5.07 mm	Km	7.9 D
JS	OK	Δ_{xys} (ft.)	173.2°
J-val: 3L°	-1.52	Fper	7.14 mm
		rmin	3.81 mm
Astig		0.2 D	

Pupil Center	+ 483 μ m	x[mm]	+0.08	y[mm]	+0.94
Pachy Apex	- 442 μ m	L.UU	0.00	U.UU	0.00
Thinnest Loca...	C 435 μ m	-0.51	-3.26		
< Max. (Front)	67.5 D	-0.33	-1.75		

Cornea Volume	54.2 mm ³	KPD	-2.5 D
Chamber Volume	164 mm ³	Angle	37.2°
A-C Depth (r.t.)	3.26 mm	Pupil Dia.	3.60 mm
Enter IOP	IOP(co)	Lens Th.	

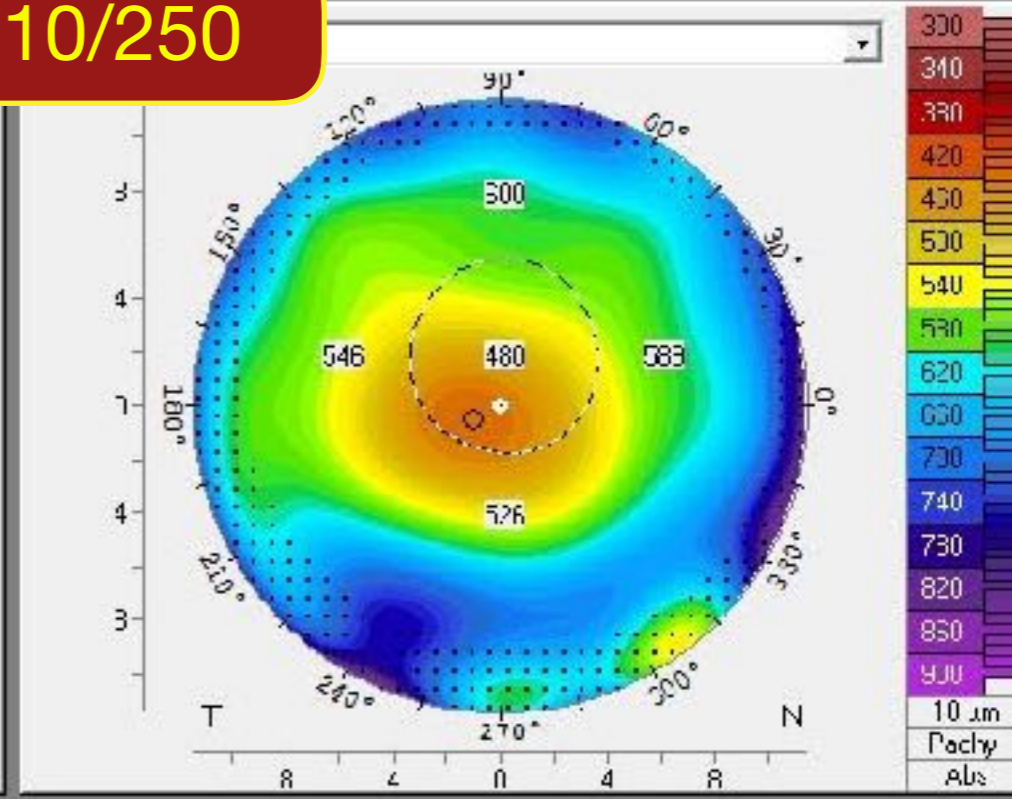


Lagoon



Nipple

210/250



OCULUS - PENTACAM 4 Maps Selectable

2070

Peninsula

Cornea Front

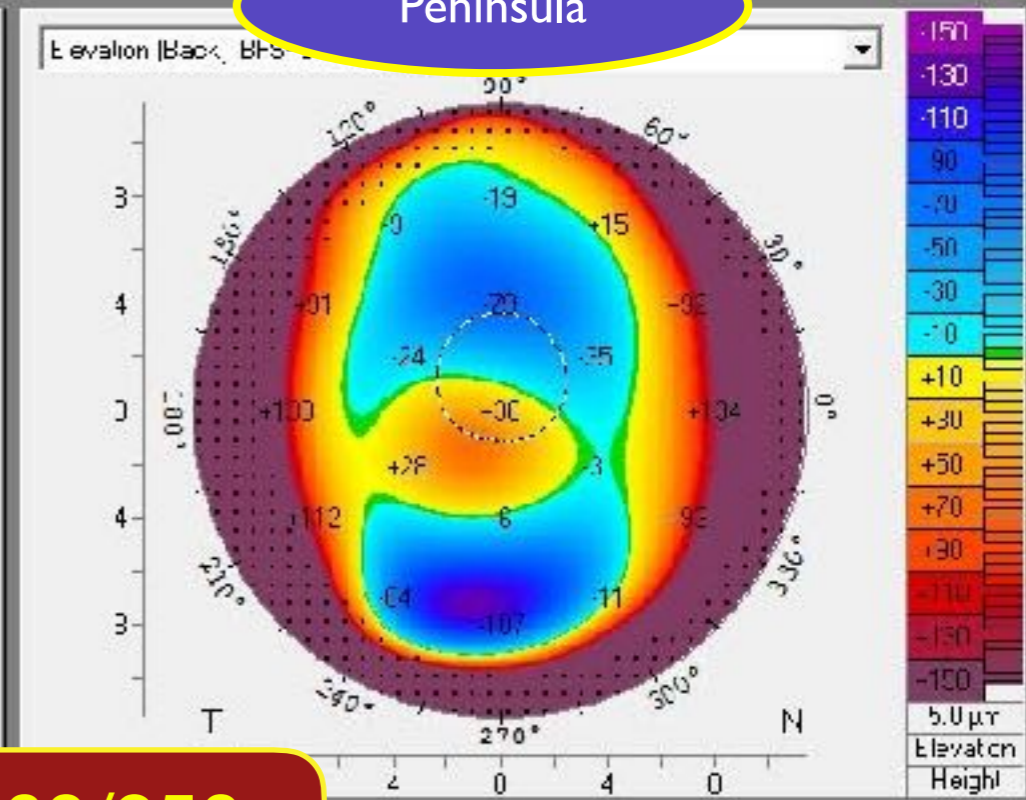
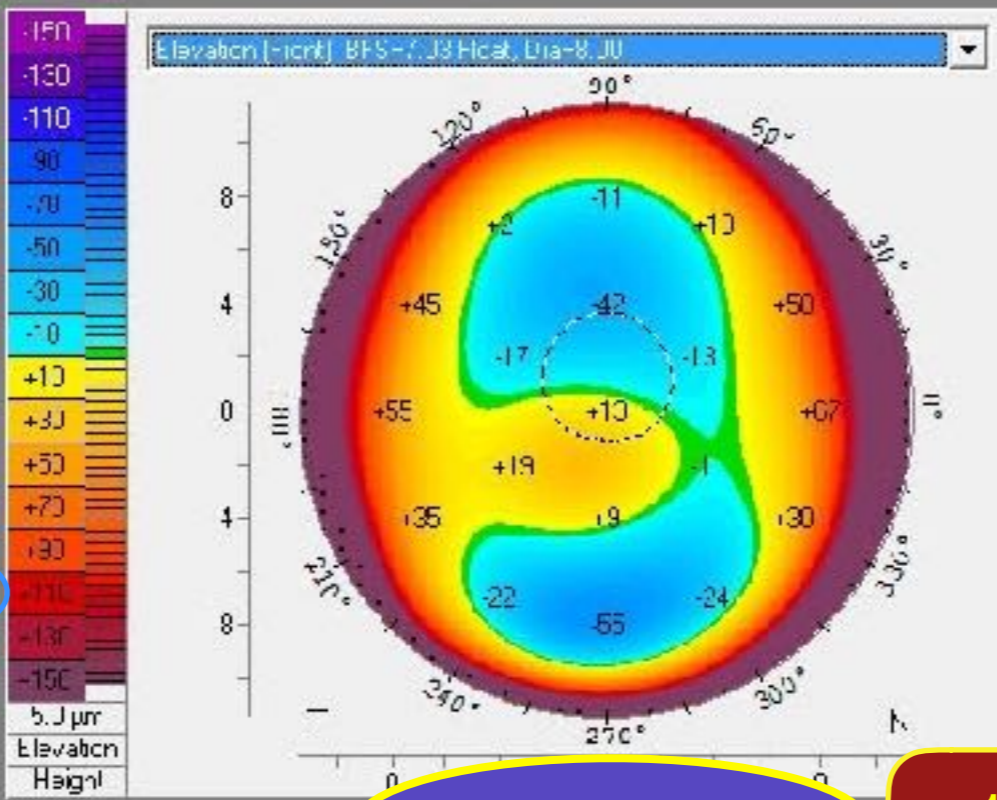
Rht	6.85 mm	K1	49.0 D
Rv	6.45 mm	K2	52.3 D
Rm	6.67 mm	Km	50.6 D
AS	OK	$\Delta_{x/s}$ (ft.)	25.2°
J-val: 30°	-0.72	Fper	7.51 mm
		rmin	5.03 mm
		Astig	3.4 D

Cornea Back

Rht	5.40 mm	K1	7.0 D
Rv	4.96 mm	K2	8.1 D
Rm	5.22 mm	Km	7.7 D
AS	OK	$\Delta_{x/s}$ (ft.)	12.2°
J-val: 30°	-1.01	Fper	6.75 mm
		rmin	1.01 mm
		Astig	0.8 D

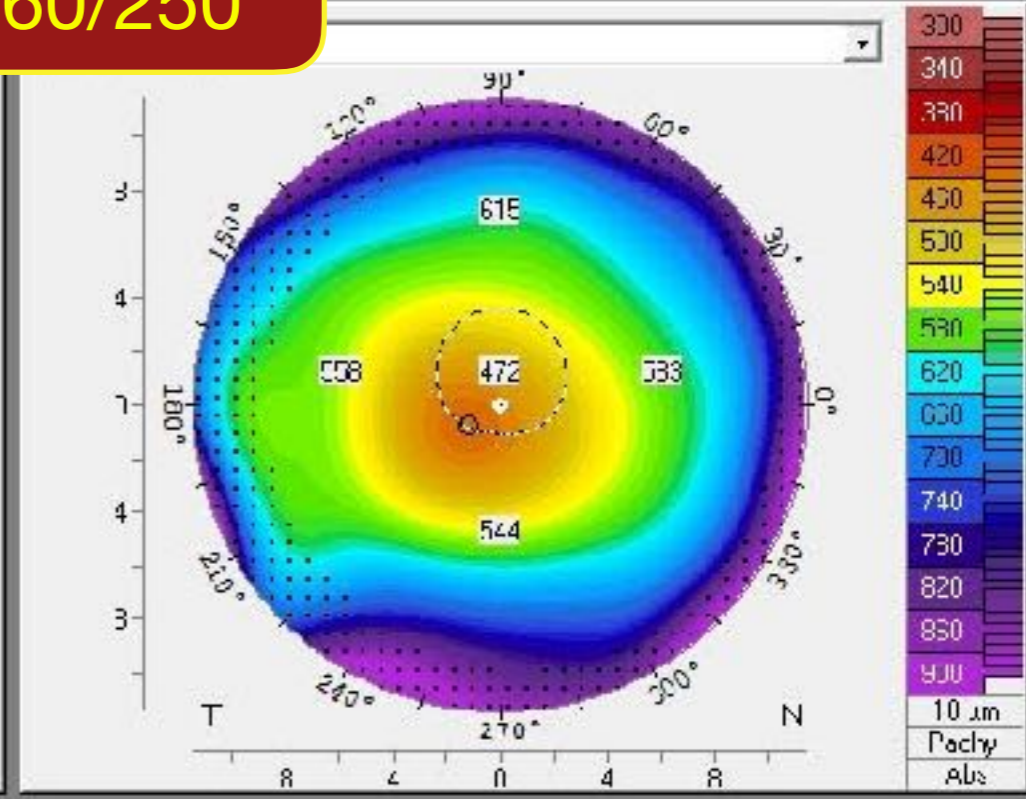
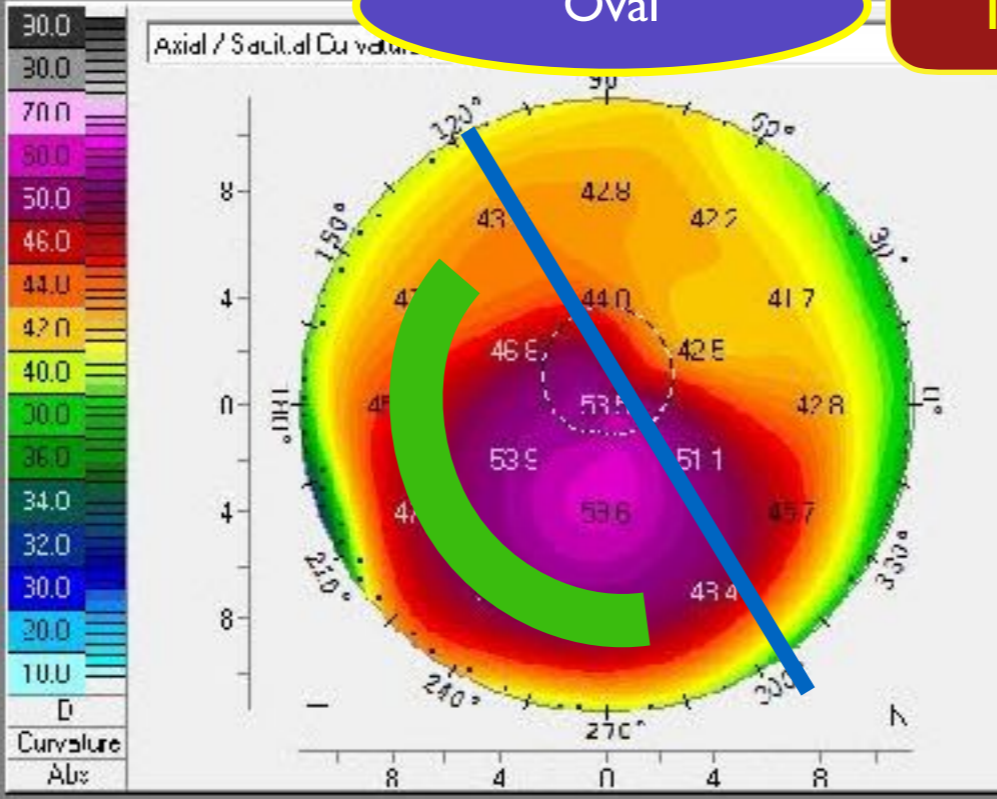
Pachy	μ m	x(mm)	y(mm)
Pupil Center	+ 472	+0.02	+0.65
Pachy Apex	- 443	L.00	0.00
Thinnest Loc...	437	-0.57	-3.38
< Max. (Front)	600	L.00	-1.66

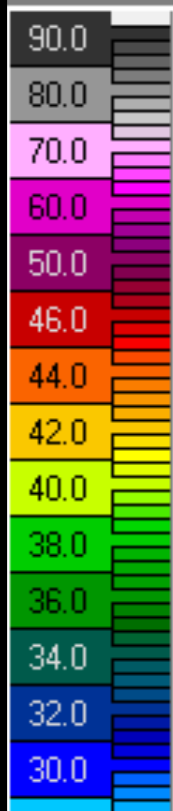
Cornea Volume	57.0 mm ³	KPD	-2.3 D
Chamber Volume	173 mm ³	Angle	36.2°
A-C Depth (r.t.)	3.45 mm	Pupil Dia.	2.43 mm
Enter ID	IOF (co)	Lens Th.	



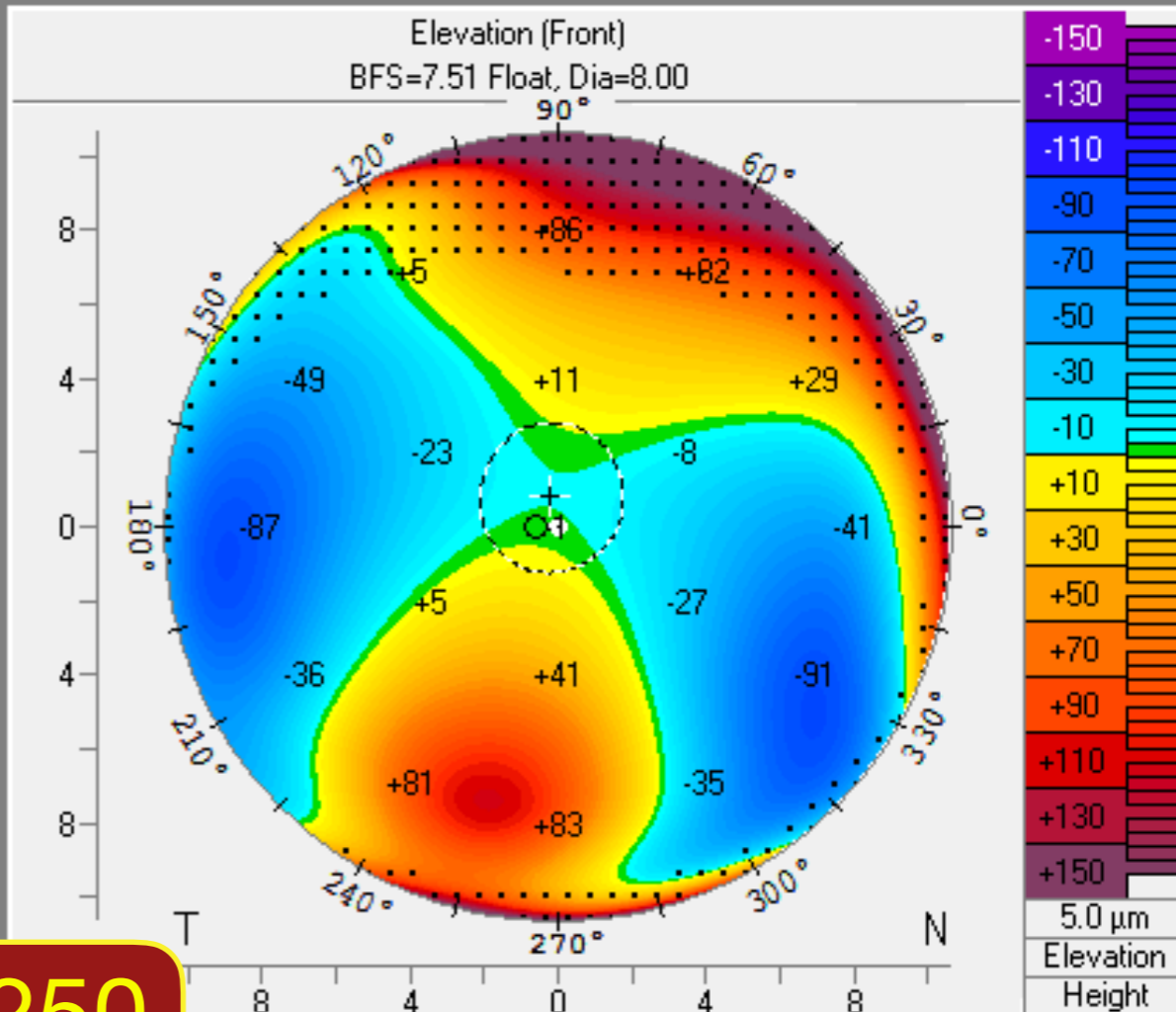
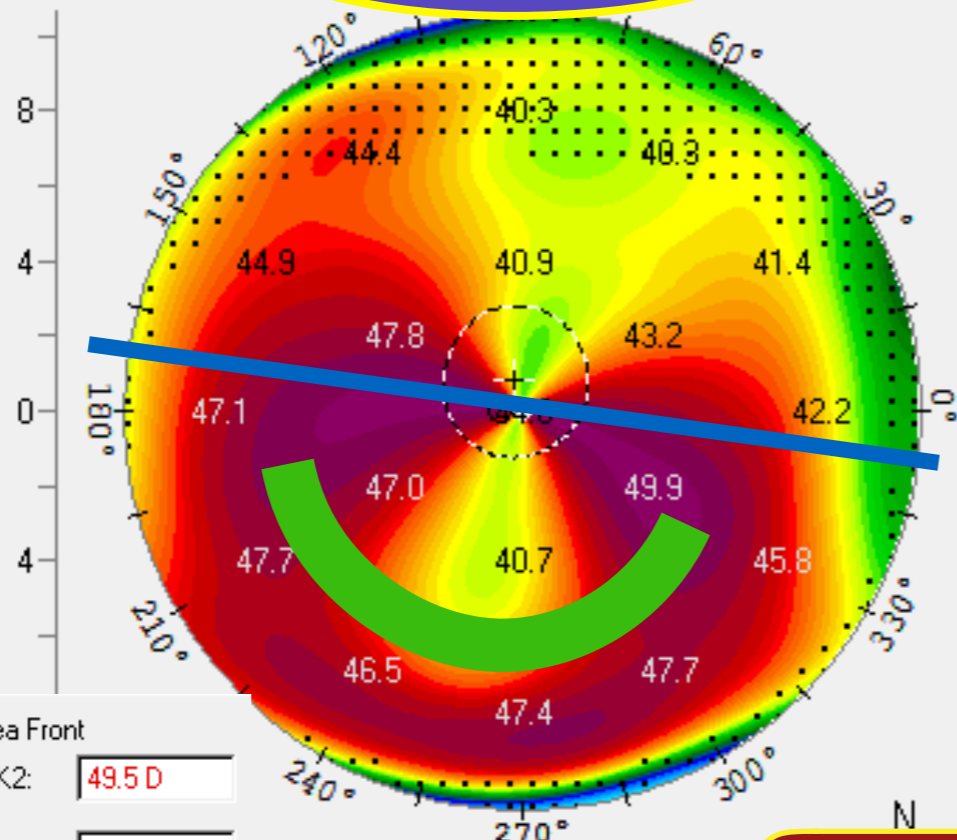
Oval

160/250





PMD

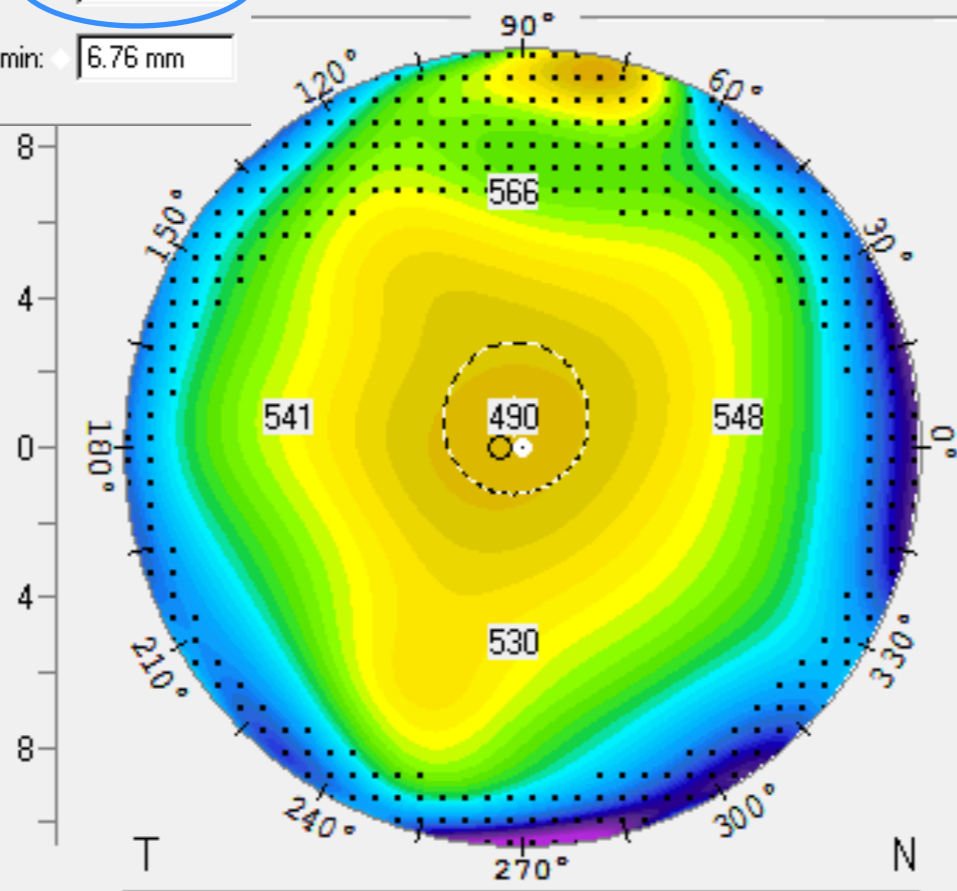
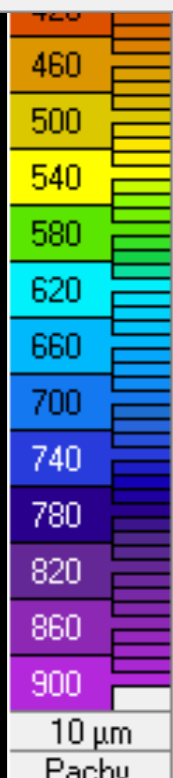


Cornea Front

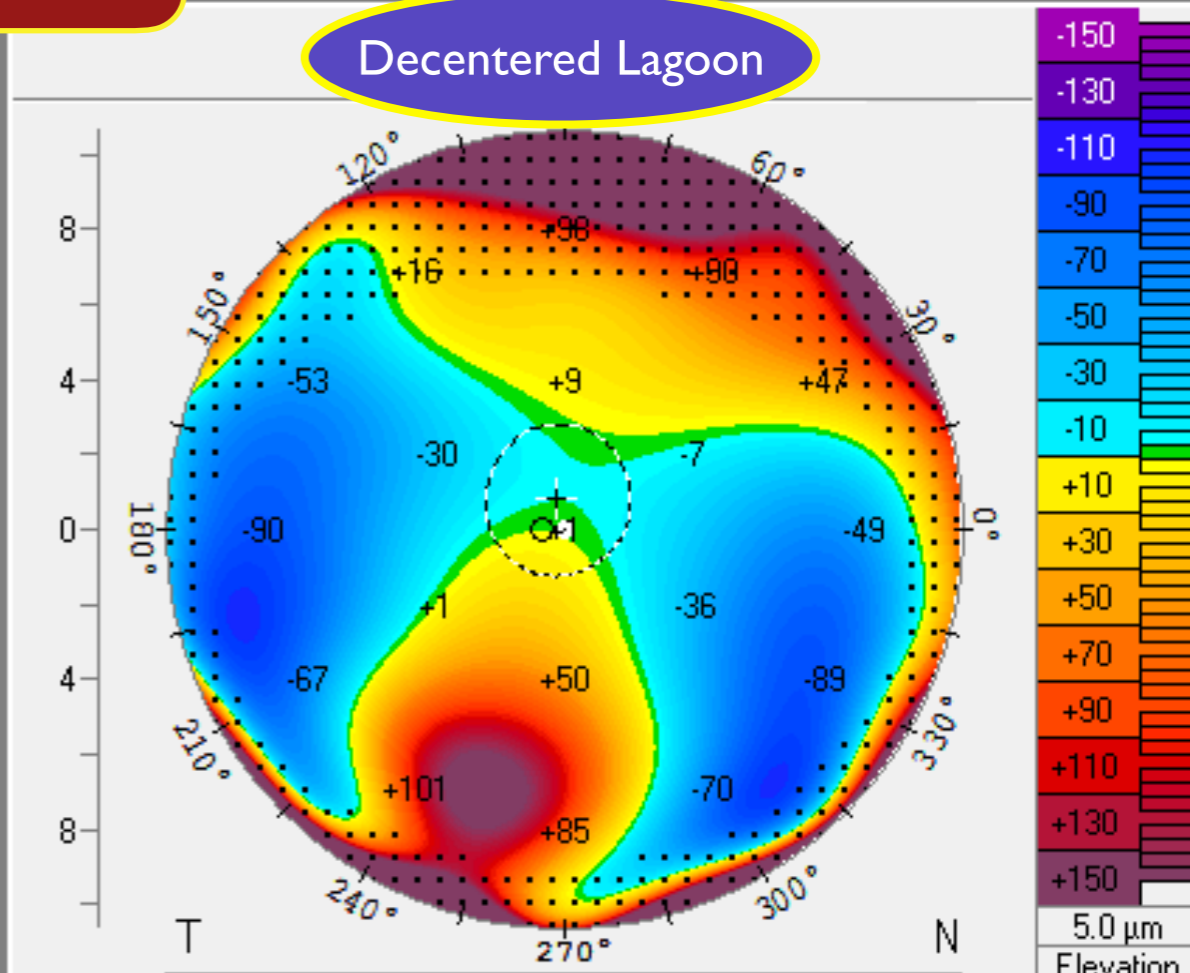
Rh:	6.82 mm	K2:	49.5 D
Rv:	8.47 mm	K1:	39.8 D
Rm:	7.65 mm	Km:	44.1 D
Axis: (flat)	75.5°	Asig:	9.6 D
Q-val: (30°)	-0.07	Rper:	7.46 mm
		Rmin:	6.76 mm

140/250

Corneal Thickness



Decentered Lagoon



NOMOGRAM

SUMMARY GENERAL RULES

Q preoperative - Q change induced by the ring = - 0.23 (TARGET FINAL Q VALUE)

NOMOGRAM

SUMMARY GENERAL RULES

- Avoid overcorrection (astigmatism axis inversion / hiperopia / positive Q);
- Avoid ICRS implantation in flat areas;
- Quality of vision (Q) is more important than the refractive result;

CONCLUSION

- The nomogram is reproducible and aims to treat the corneal deformity (not the refraction);
- The posterior elevation maps may aid the identification of keratoconus type;
- Posterior elevation may provide better morphology classification of ectasia phenotype than the usual maps (sagittal / axial);



THANK YOU!!!



leonardo@ceoclinica.med.br

CLINICAL CASES

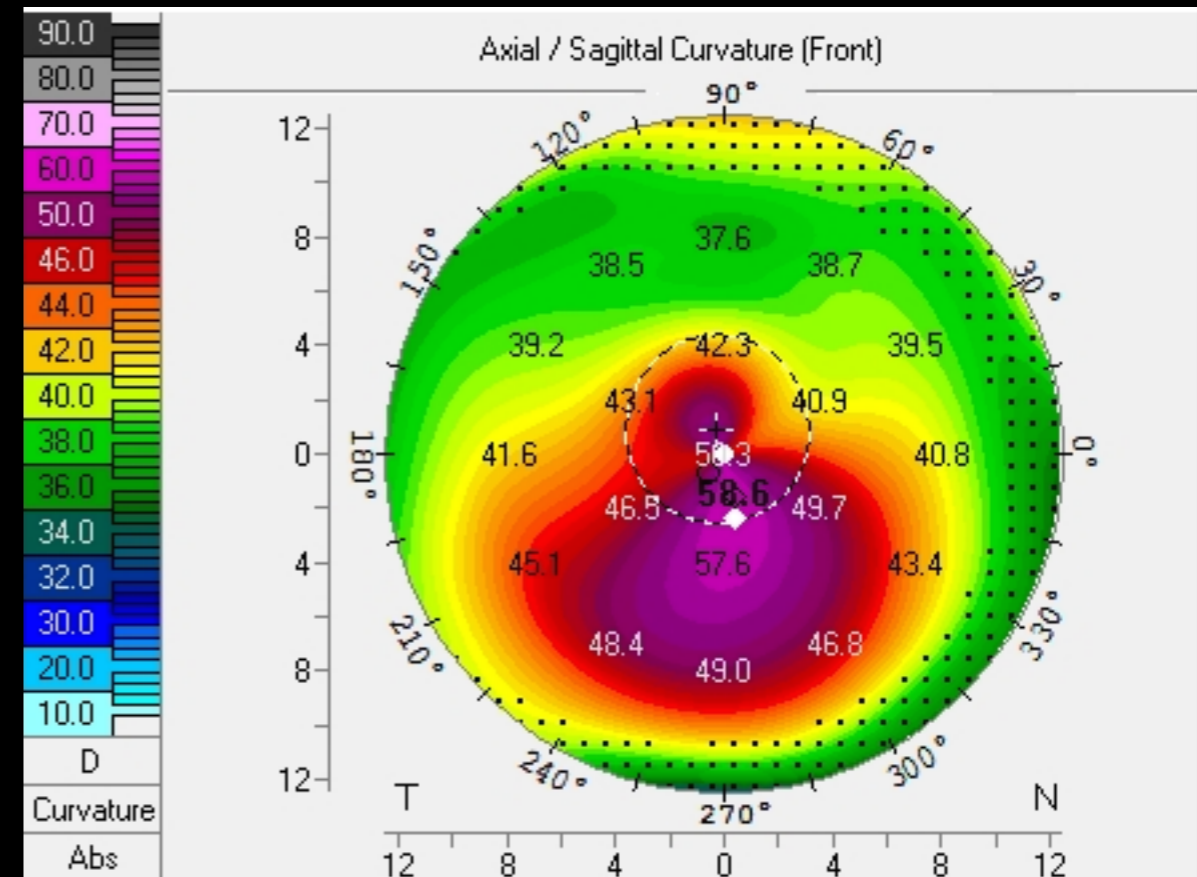
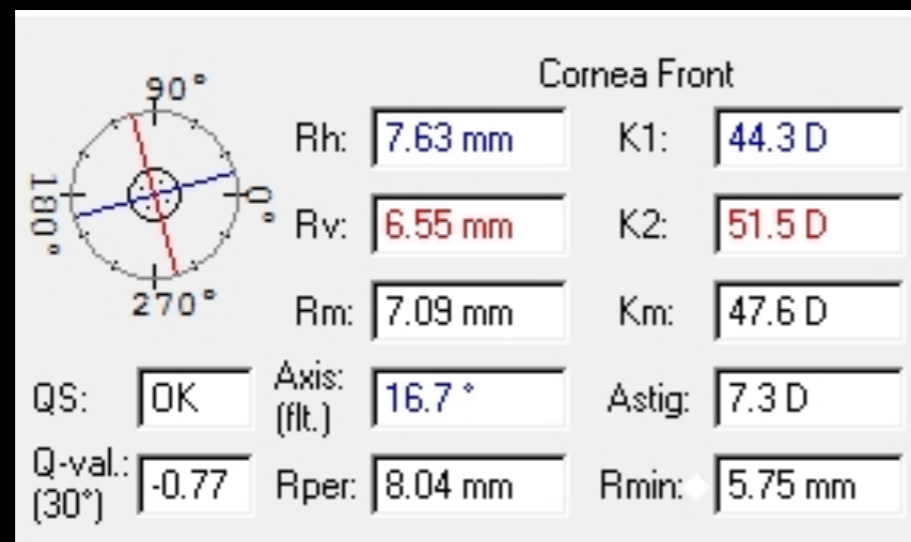
CASE 1

$Q = -0,77$, $K1 = 44,3 \text{ D}$ $K2 = 50,8 \text{ D}$ Astigm = $5,1 \text{ D}$

Classification **Oval**

$-0,77 (Q)$ - $x = -0,23$ $x = 0,54$

Surgical Plan **160/150 + 160/150**

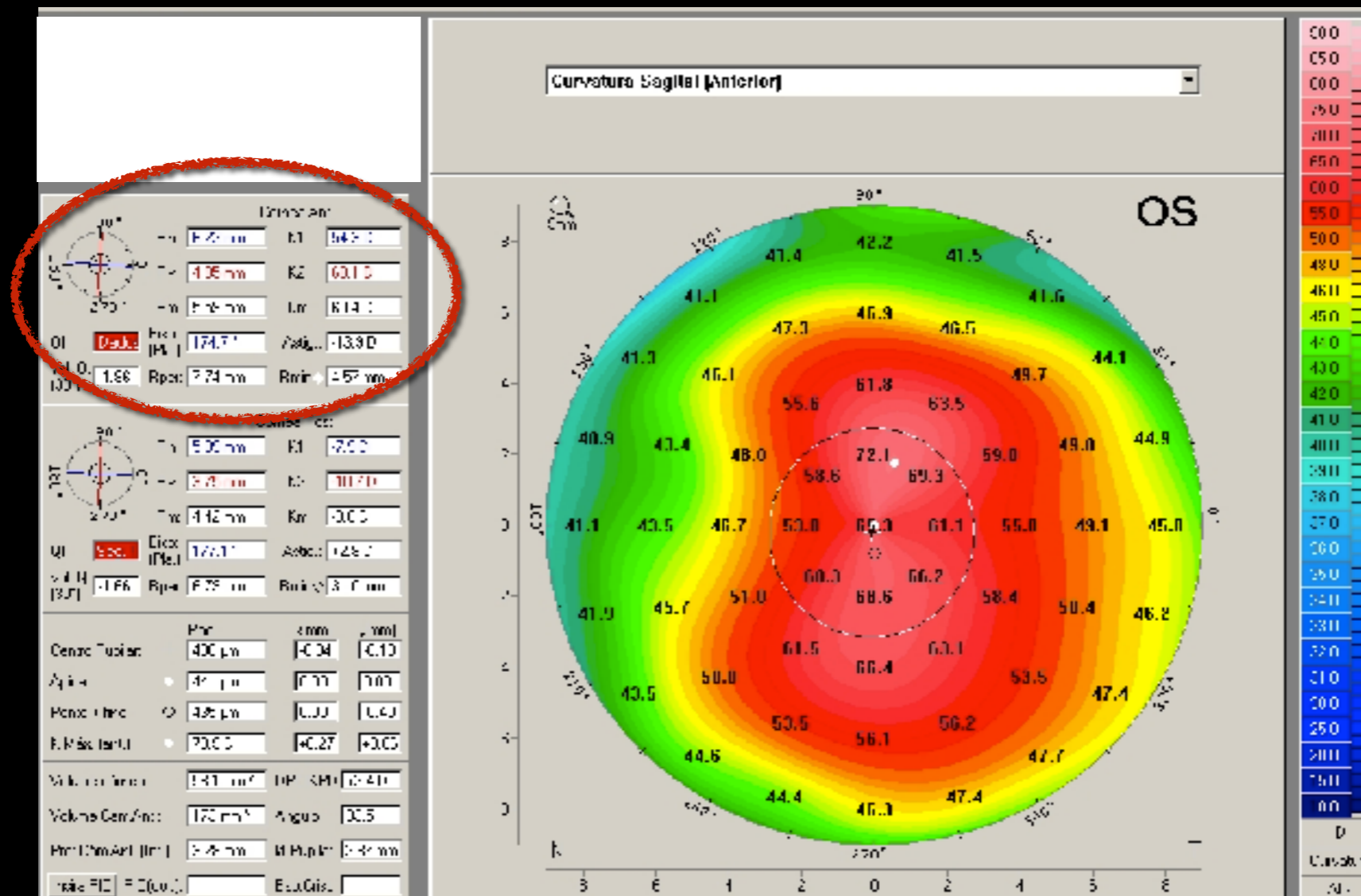


CASE 2

Q = -1,86, K1 = 54,3 D K2 = 68,1 D Astigm = 13,9 D

Classification
Surgical Plan

Astigmatic
140/250 + 140/250



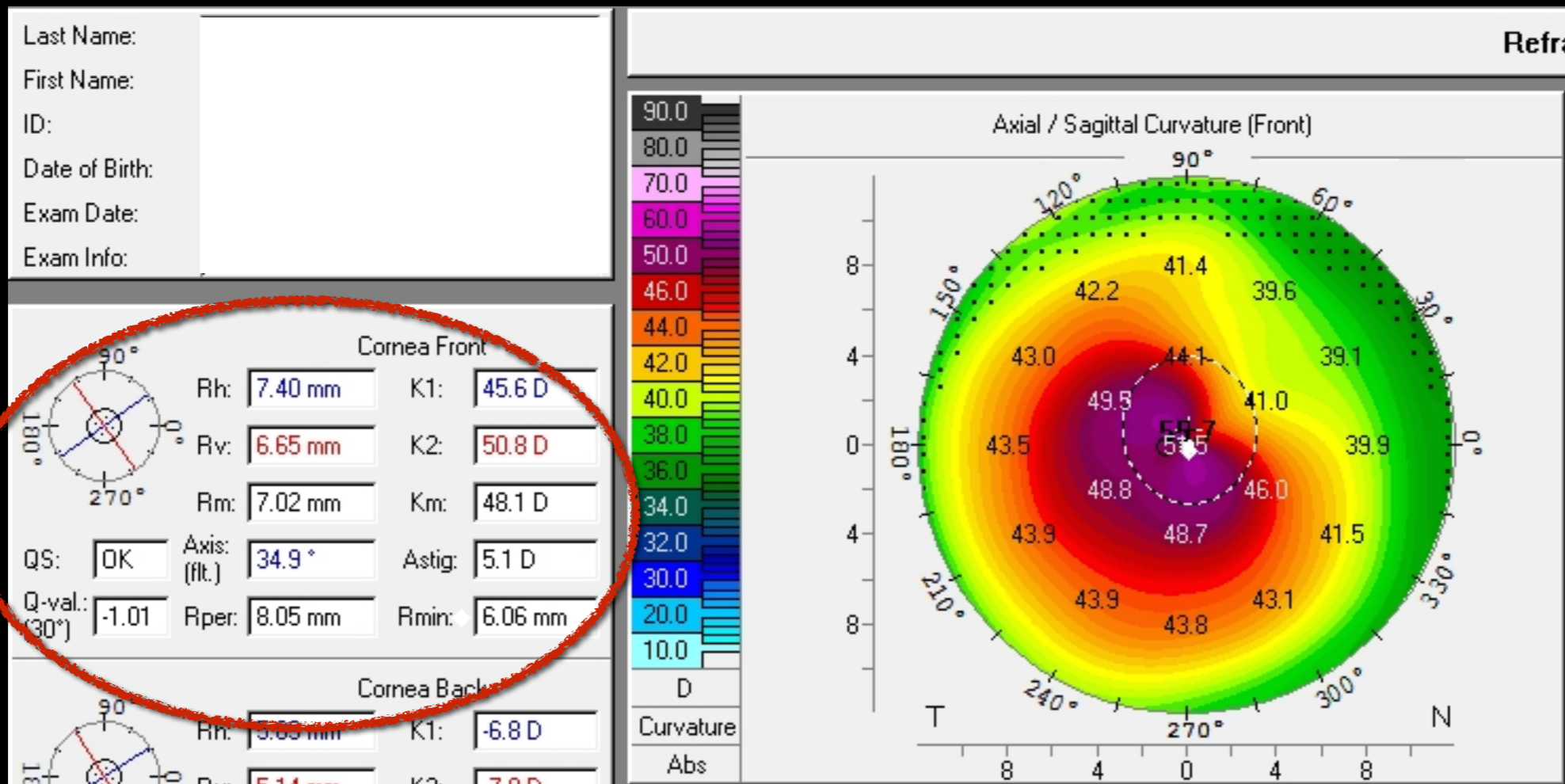
CASE 3

Q = -1,01, K1 = 45,6 D K2 = 50,8 D Astigm = 5,1 D

Classification **Oval**

-1,01 (Q) - x = - 0,23 x = 0,78

Surgical Plan **160/200 + 160/150**



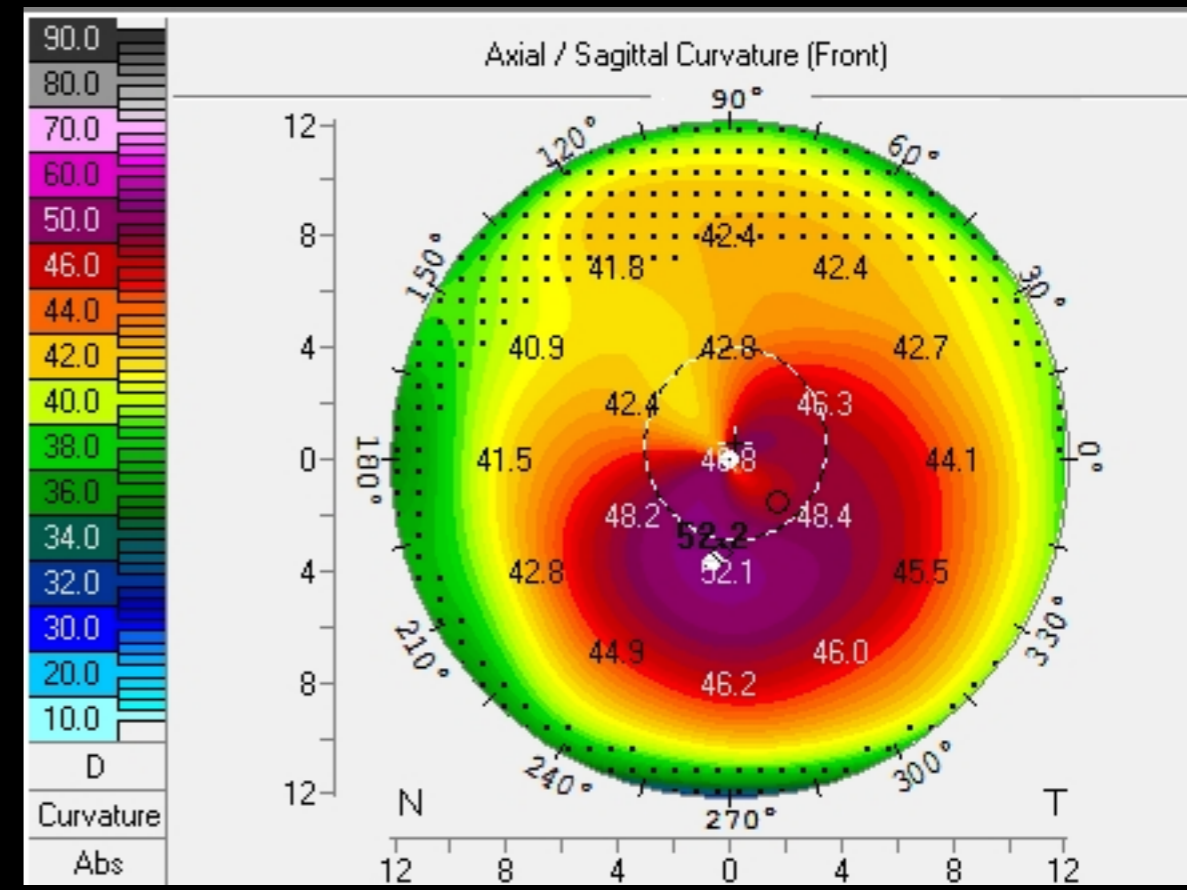
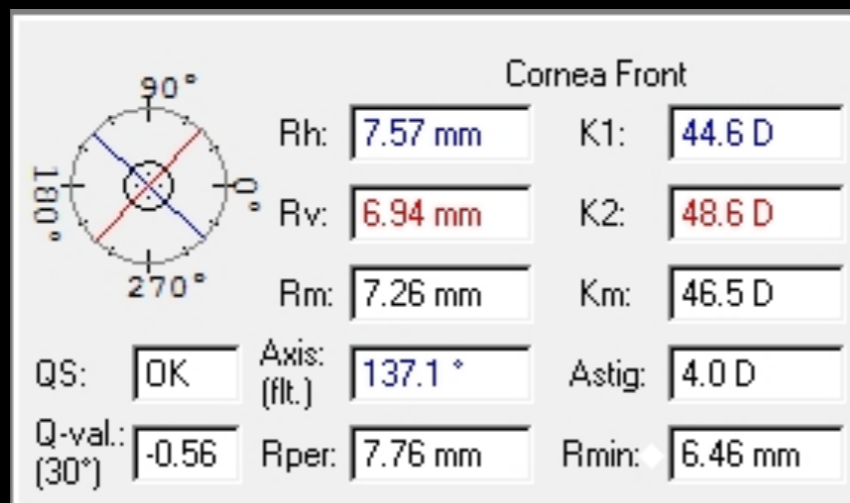
CASE 5

Q = -0,56 K1 = 44,6 D K2 = 48,6 D Astigm = 4,0 D

Classification **Oval**

-0,56 (Q) - x = - 0,23 x = 0,33

Surgical Plan **160/200**

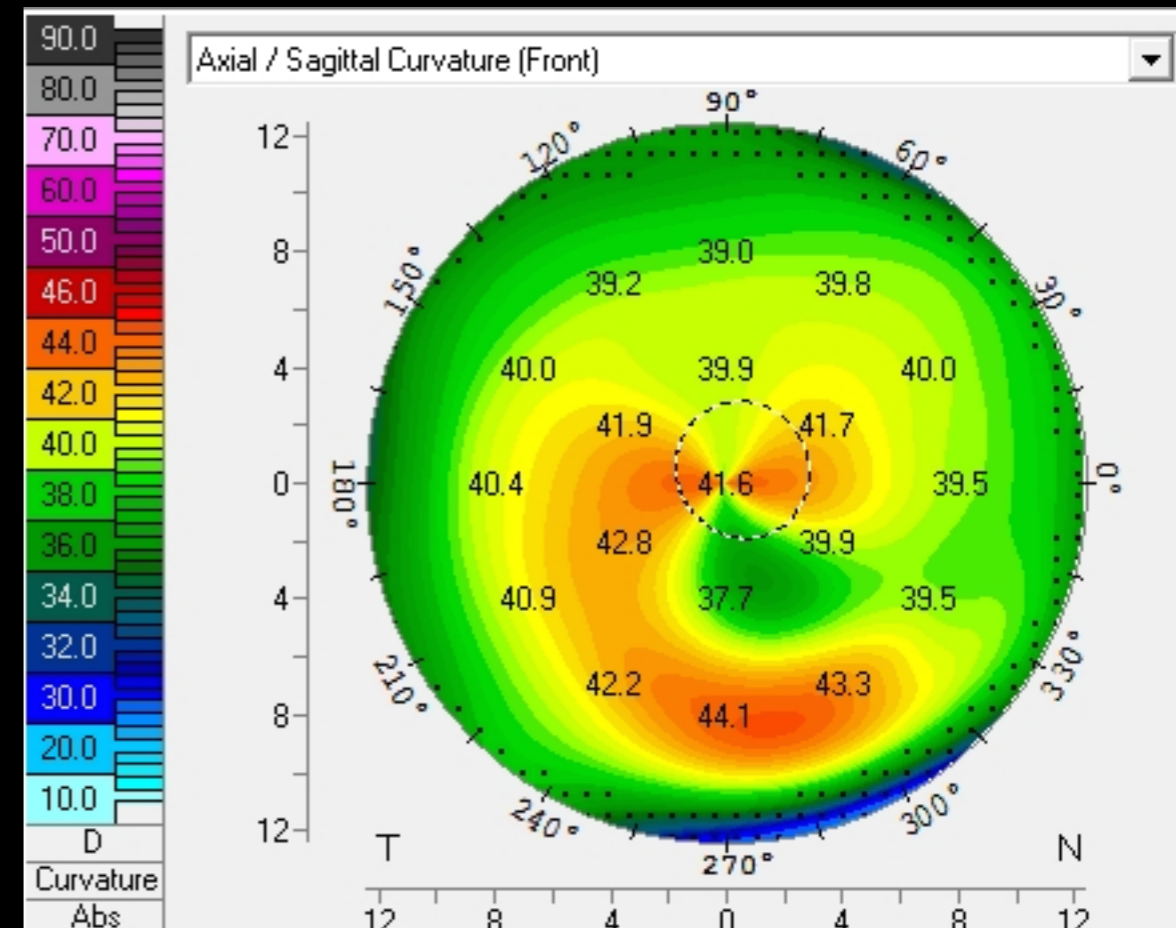
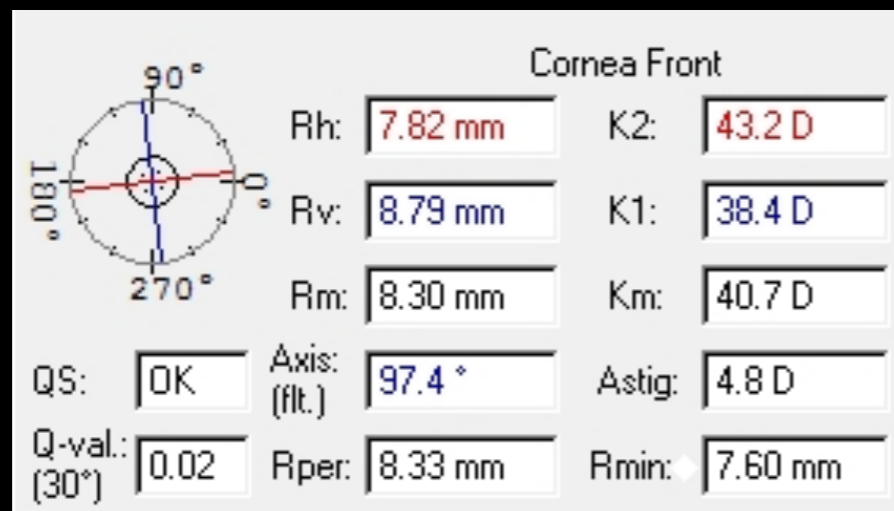


CASE 6

Q = 0,02 K1 = 43,2 D K2 = 38,4 D Astigm = 4,8 D

Classification **DMP "like"**

Surgical Plan **140/150**



CASE 7

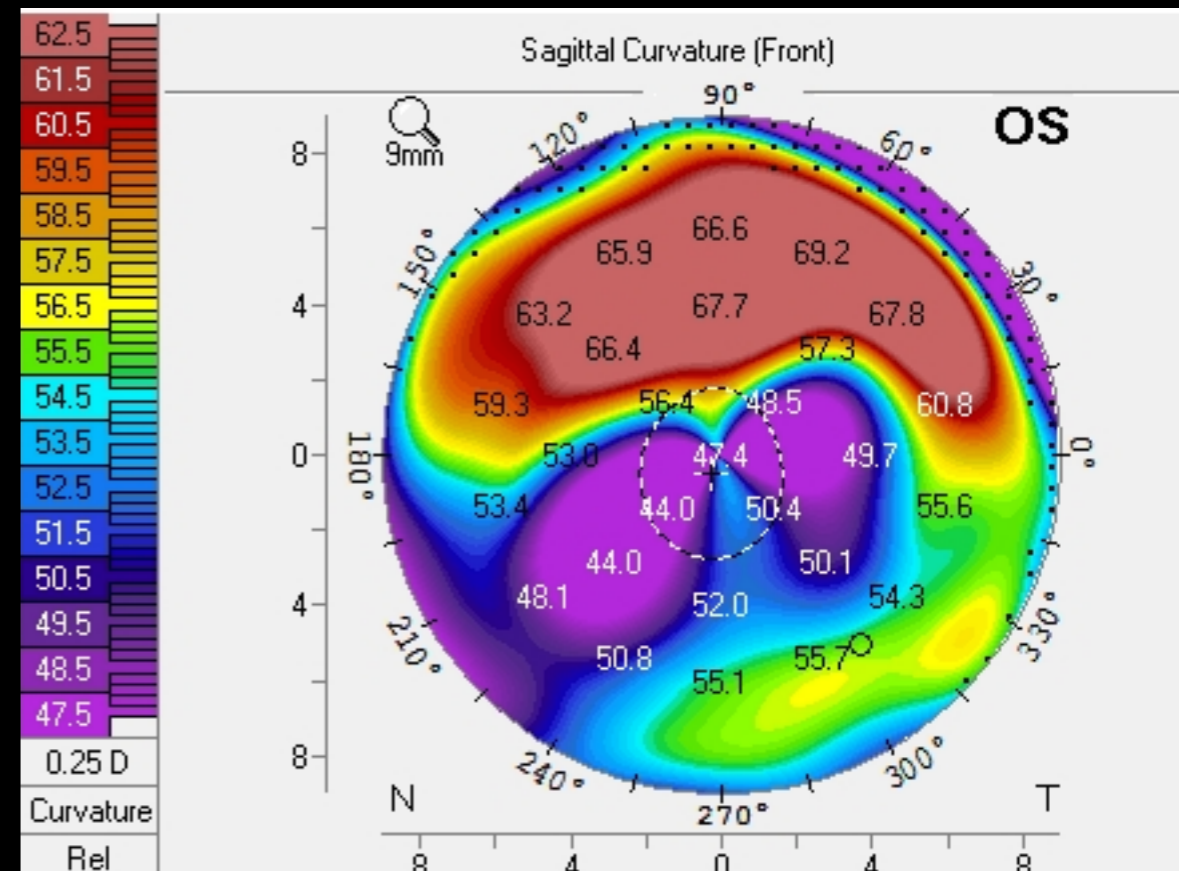
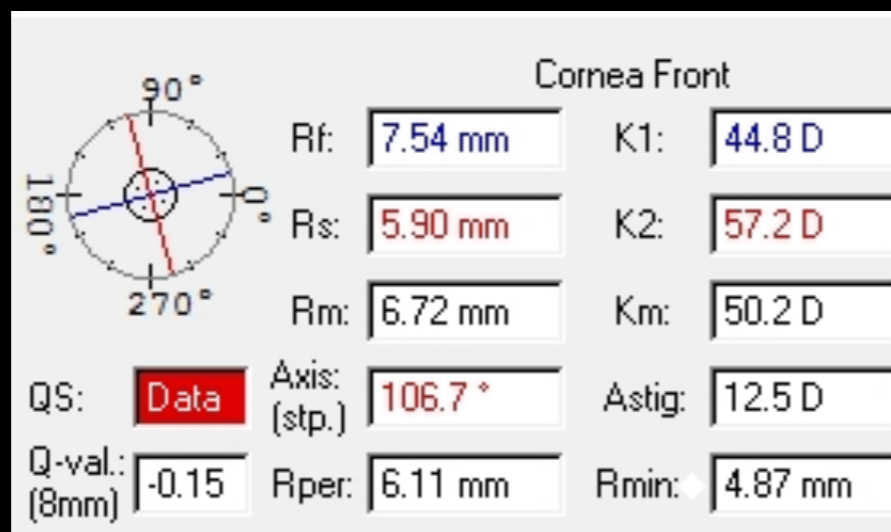
$Q = -0,15$ $K1 = 44,8$ D $K2 = 57,2$ D Astigm = 12,5 D

Classification

Post-keratoplasty

Surgical Plan

140/250 + 140/250



CASE 8

Q = -1,71 K1 = 52,4 D K2 = 55,6 D Astigm = 3,3 D

Classification **Nipple**

-1,71 (Q) - x = - 0,23 x = 1,48

Surgical Plan **320/250**

