

CENTRO OFTALMOLOGICO CARRIAZO



Bioptics

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CENTRO OFTALMOLOGICO CARRIAZO

BARRANQUILLA, COLOMBIA

Estudio inicial



- | El concepto se introdujo por Roberto Zaldivar MD, Buenos Aires.
- | Amplia investigación con las lentes intraoculares fáquicos y hacer un tx para hacer frente a las deficiencias de los implantes.

Zaldivar R, Davidorf JM, Oscherow S, et al. Combined posterior chamber phakic intraocular lens and laser in situ keratomileusis: bioptics for extreme myopia. J Refract Surg 1999; 15:299–308



Concepto

- | Indicado para pacientes que con un solo sistema optico no logramos corregir adecuadamente su defecto refractivo

Historia.... Lentes faquicas sin astigmatismos

Zaldivar R, Davidorf JM, Oscherow S, et al. Combined posterior chamber phakic intraocular lens and laser in situ keratomileusis: bioptics for extreme myopia. J Refract Surg 1999; 15:299–308

Bioptics

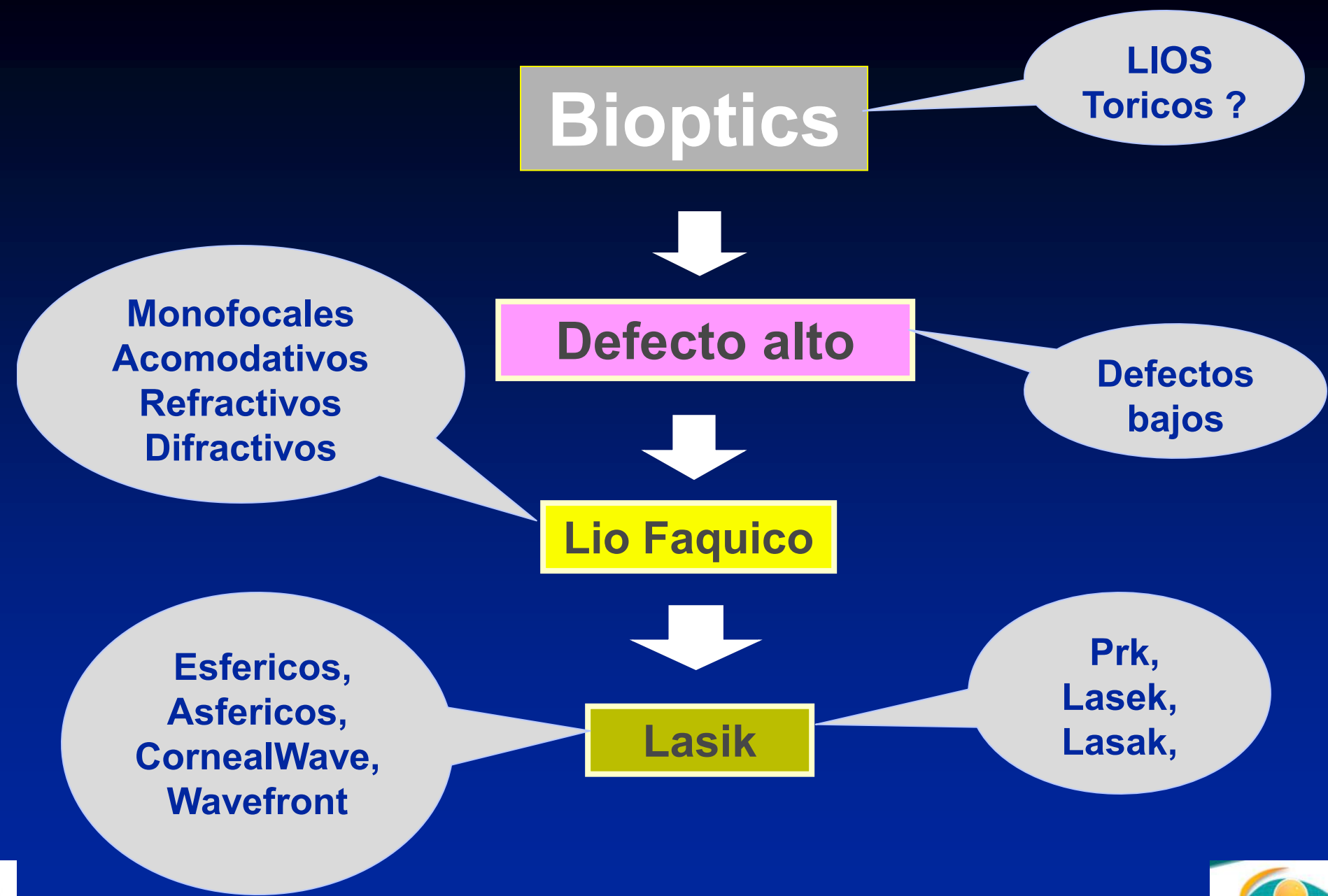
- | Guell Artisan. Lasik ajustable precut para garantizar buena calidad optica Zona Optica 6.5 [Ophthalmology](#) **Volume 108, Issue 5**, May 2001, Pages 945–952
 - » R Zaldivar, J.M Davidorf, S Oscherow *et al.*
 - » Combined posterior chamber phakic intraocular lens and laser in situ keratomileusis bioptics for extreme myopia
 - » J Refract Surg, 15 (1999), pp. 299–308



Indicaciones



- Los pacientes que no son candidatos para biópticos generalmente son los que son candidatos para Qx refractiva común.



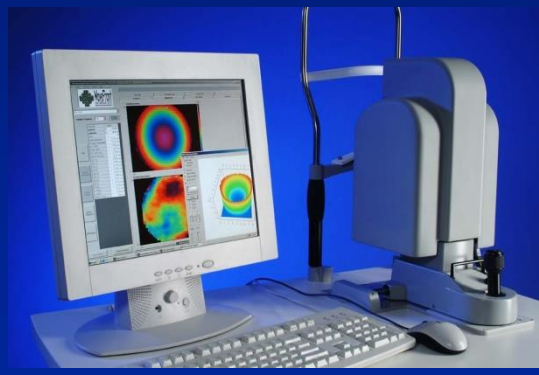
Cornea Sana



Asferico



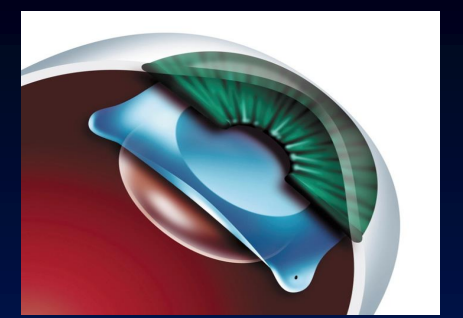
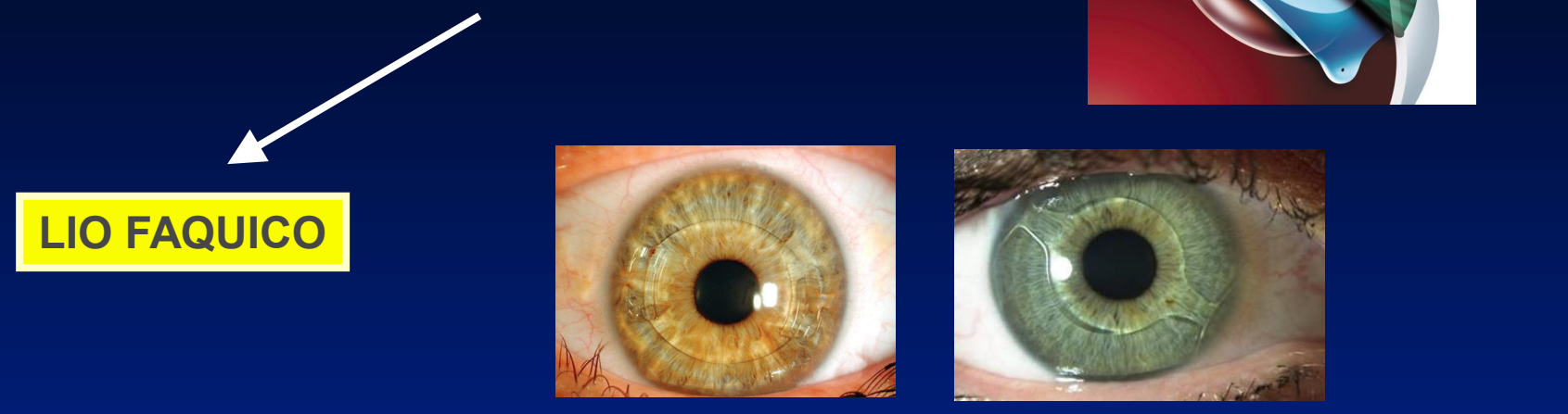
Corneal Wave



Wavefront Analyzer



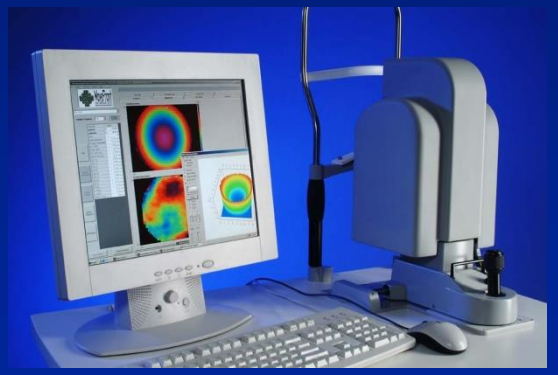
Cornea Sana



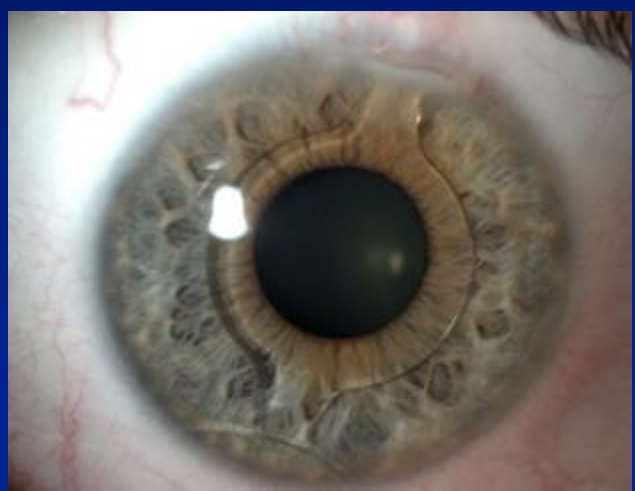
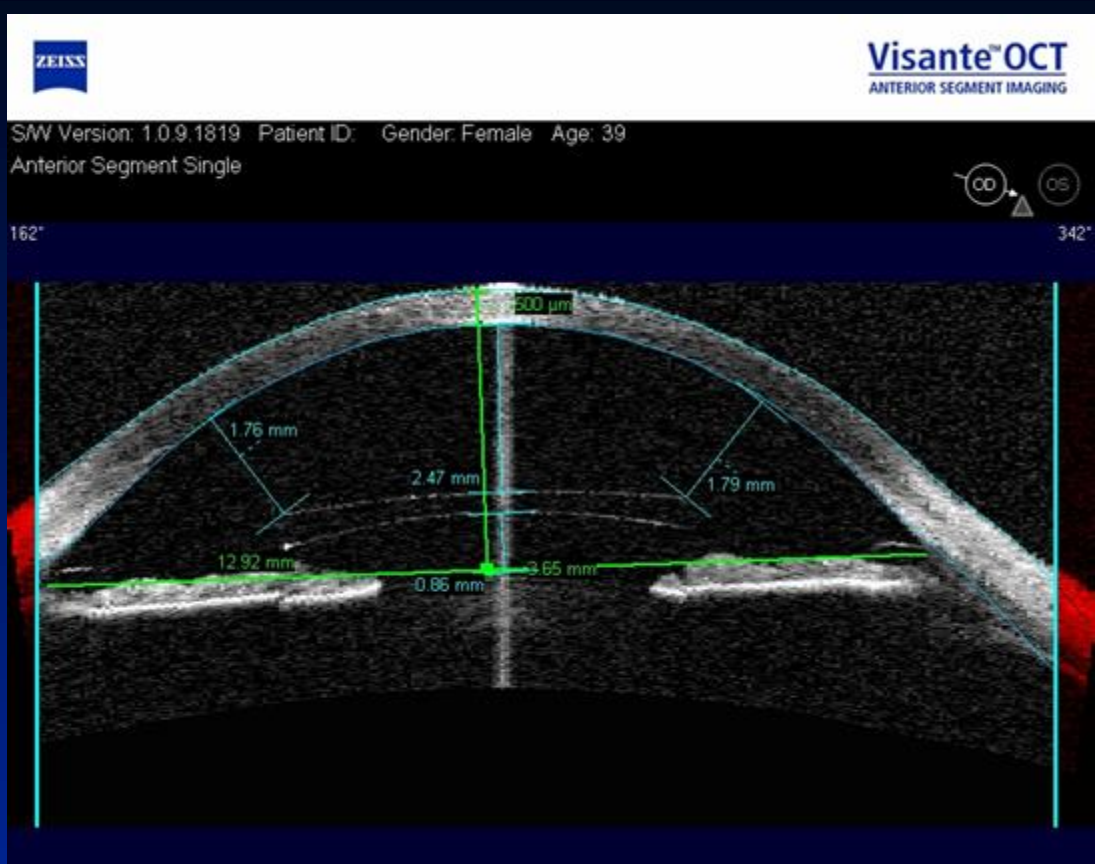
Asferico



Corneal Wave



Wavefront Analyzer



Cornea Sana



Asferico



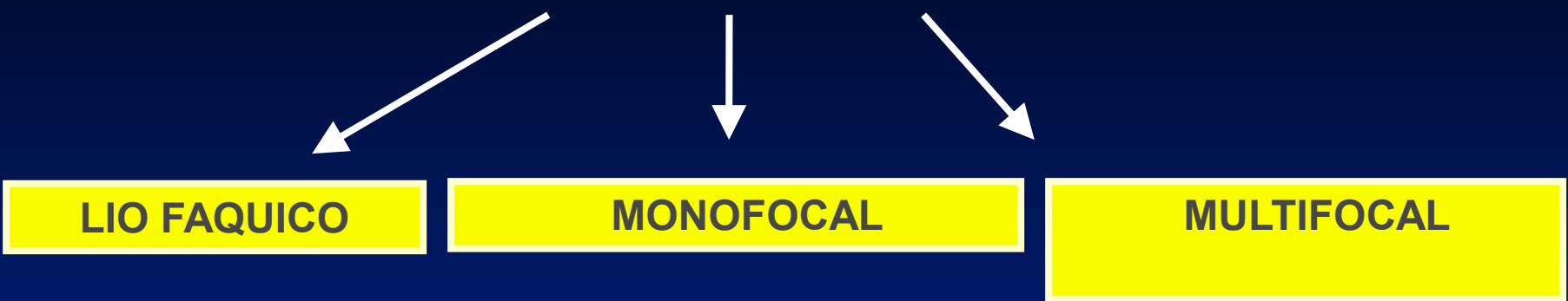
Corneal Wave



Wavefront Analyzer



Cornea Sana



Asferico



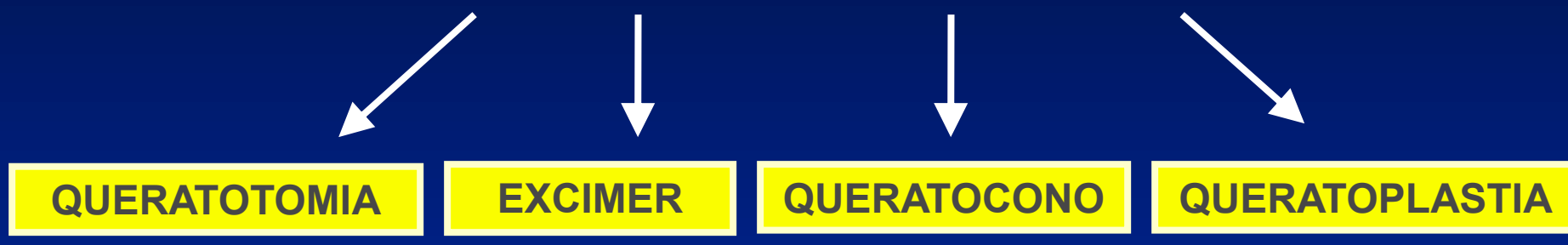
Corneal Wave



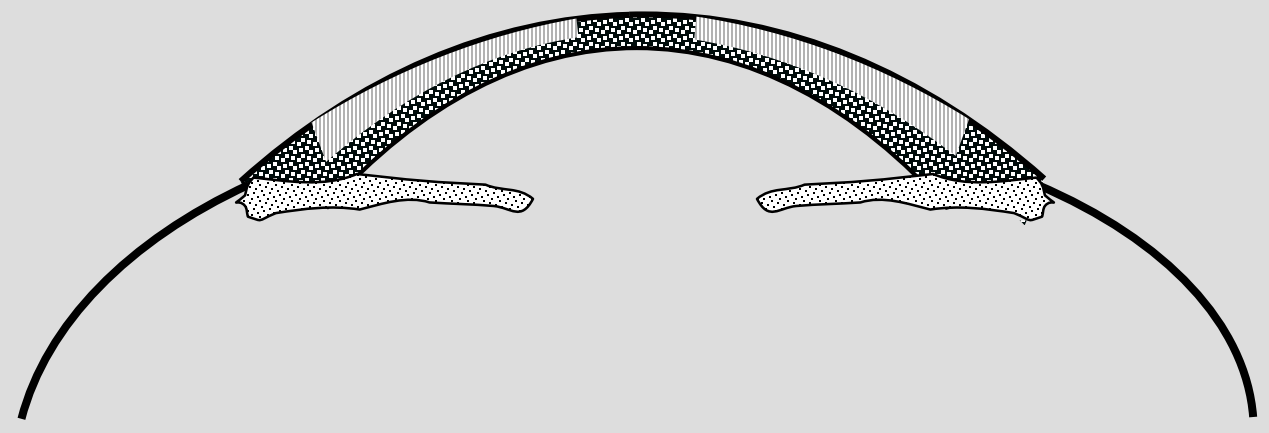
Wavefront Analyzer

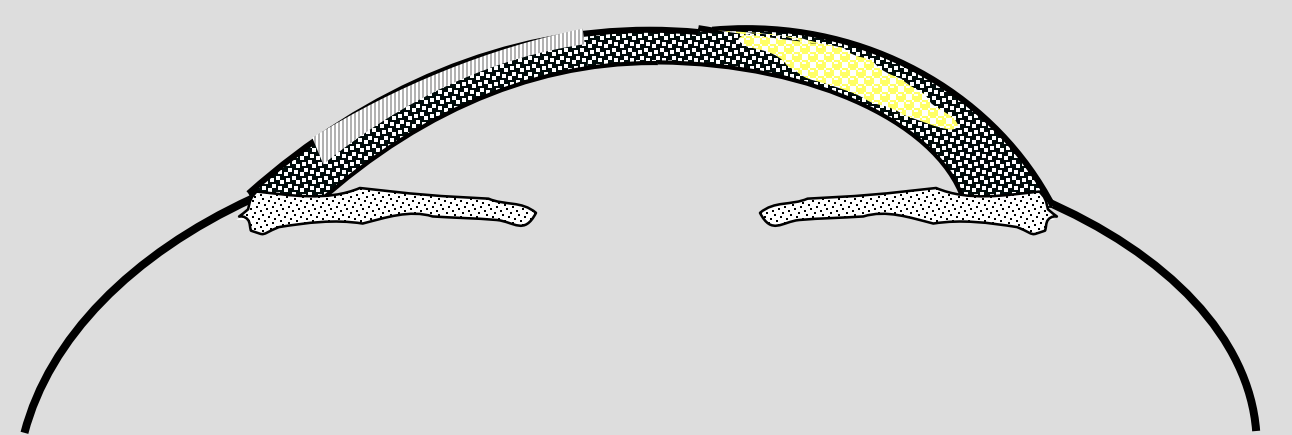
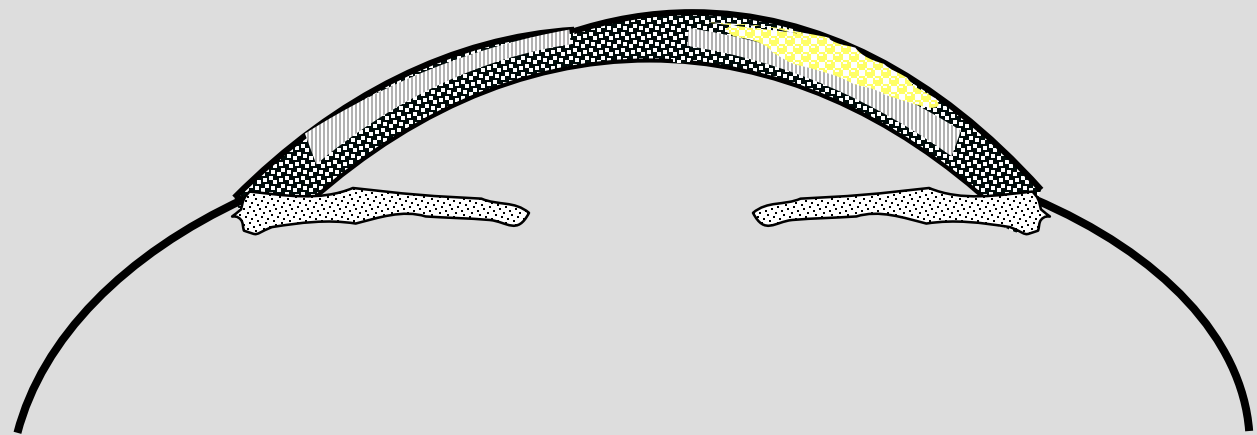
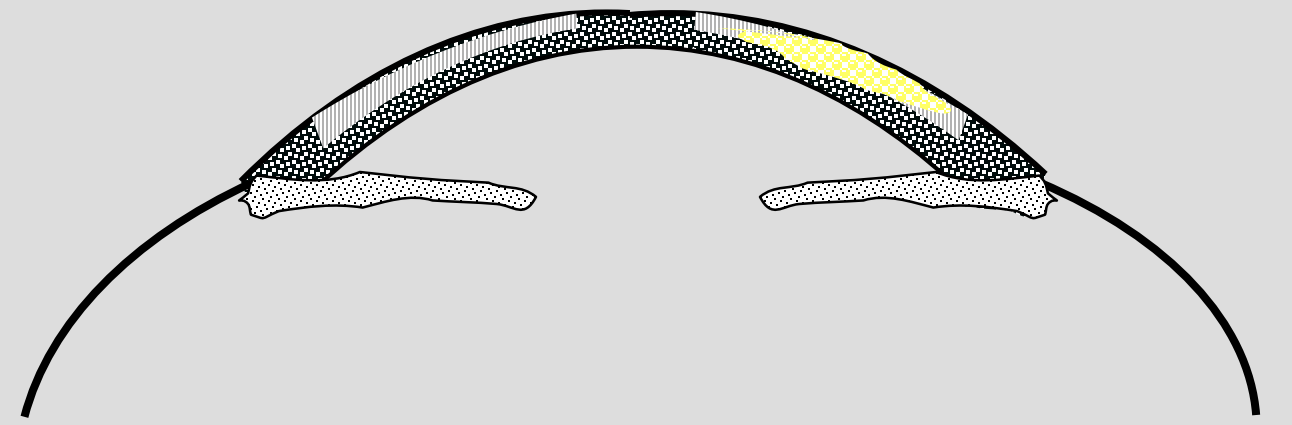
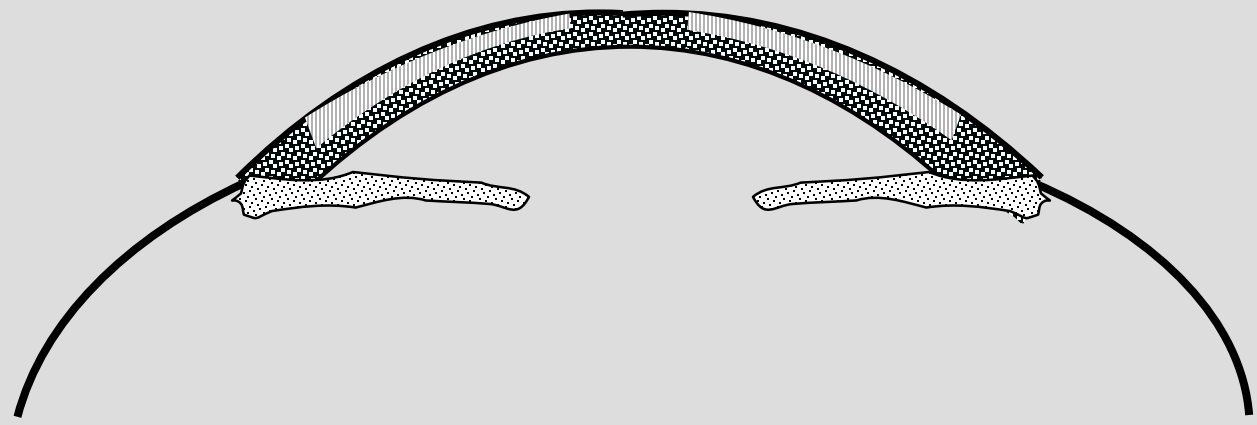


Cornea ABERRADA



Cornea ABERRADA



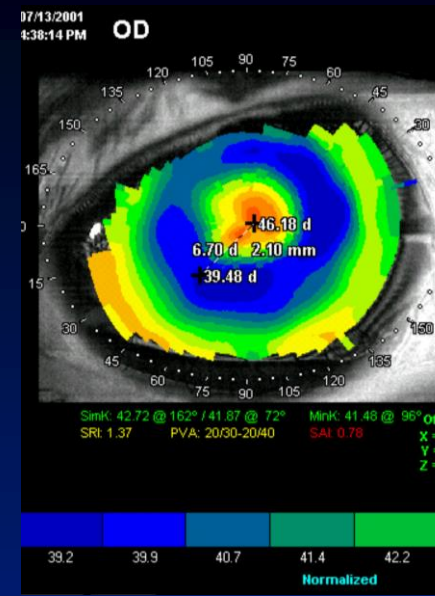


Cornea ABERRADA

QUERATOTOMIA

LIO TORICO ...

EXCIMER ...

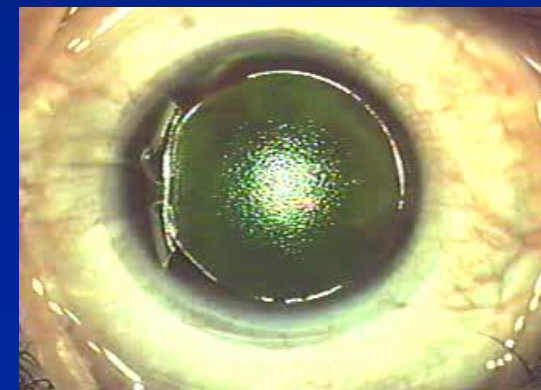


Cornea ABERRADA

EXCIMER

LIO TORICO ...

CIRUGIA CORNEAL..



Cornea ABERRADA

ECTASIA

CROSS-LINKING..

ANILLOS ...

LIO TORICO..

EXCIMER ...

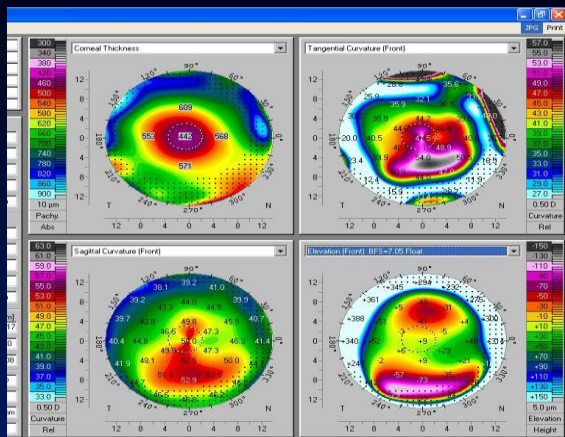
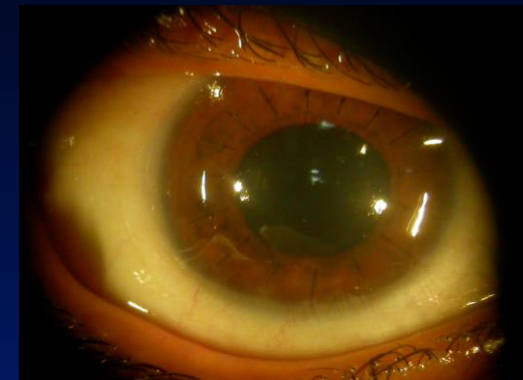


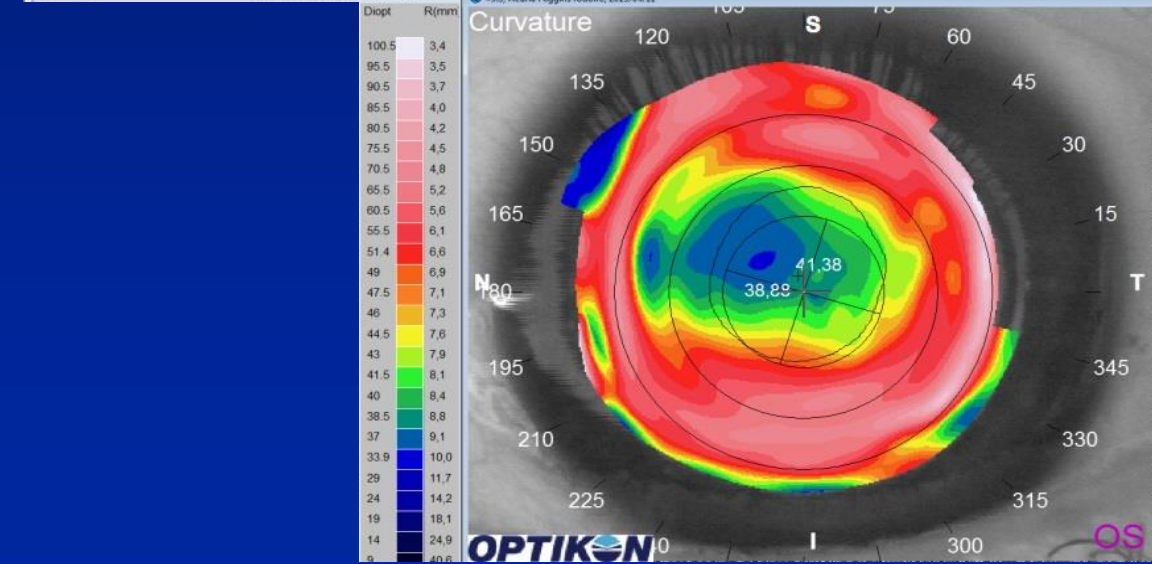
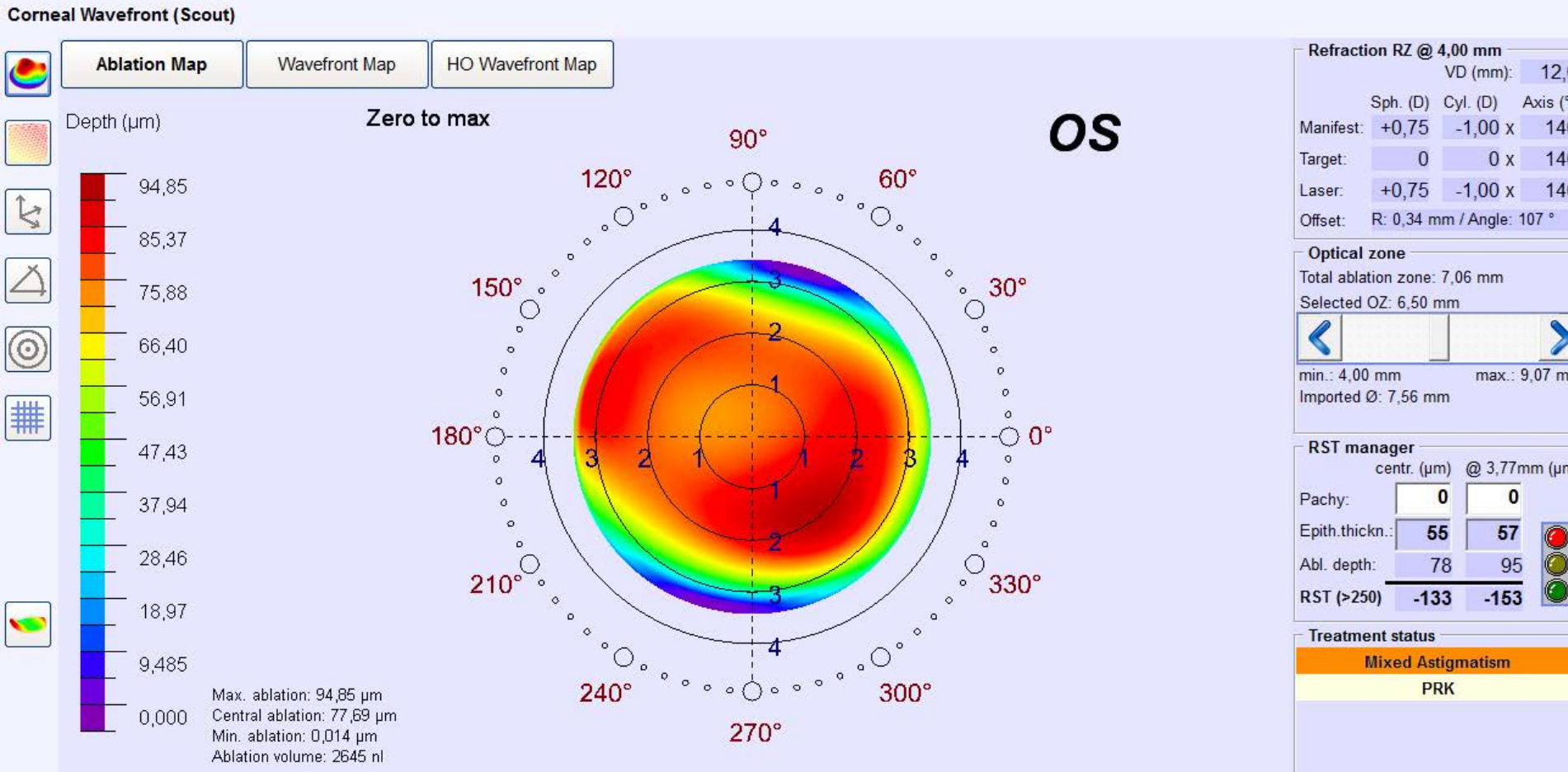
Cornea ABERRADA

QUERATOPLASTIA

LIO TORICO ...

CIRUGIA CORNEAL.





Pyramid Refraction OS

Legend:
red color: value > 0.50 D
yellow color: value in [0.25 ; 0.50] D
green color: value <= 0.25 D

button down: Zernike term disabled

HO

Cor

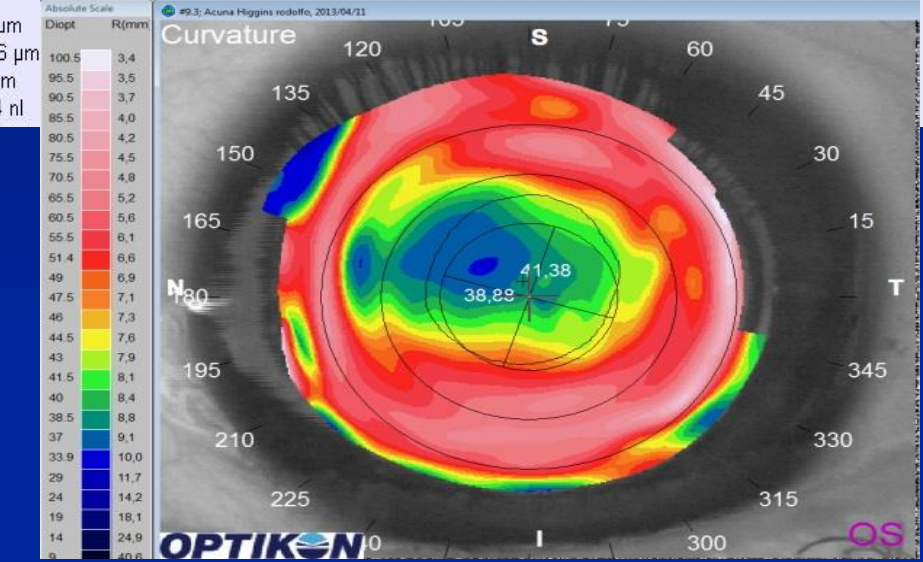
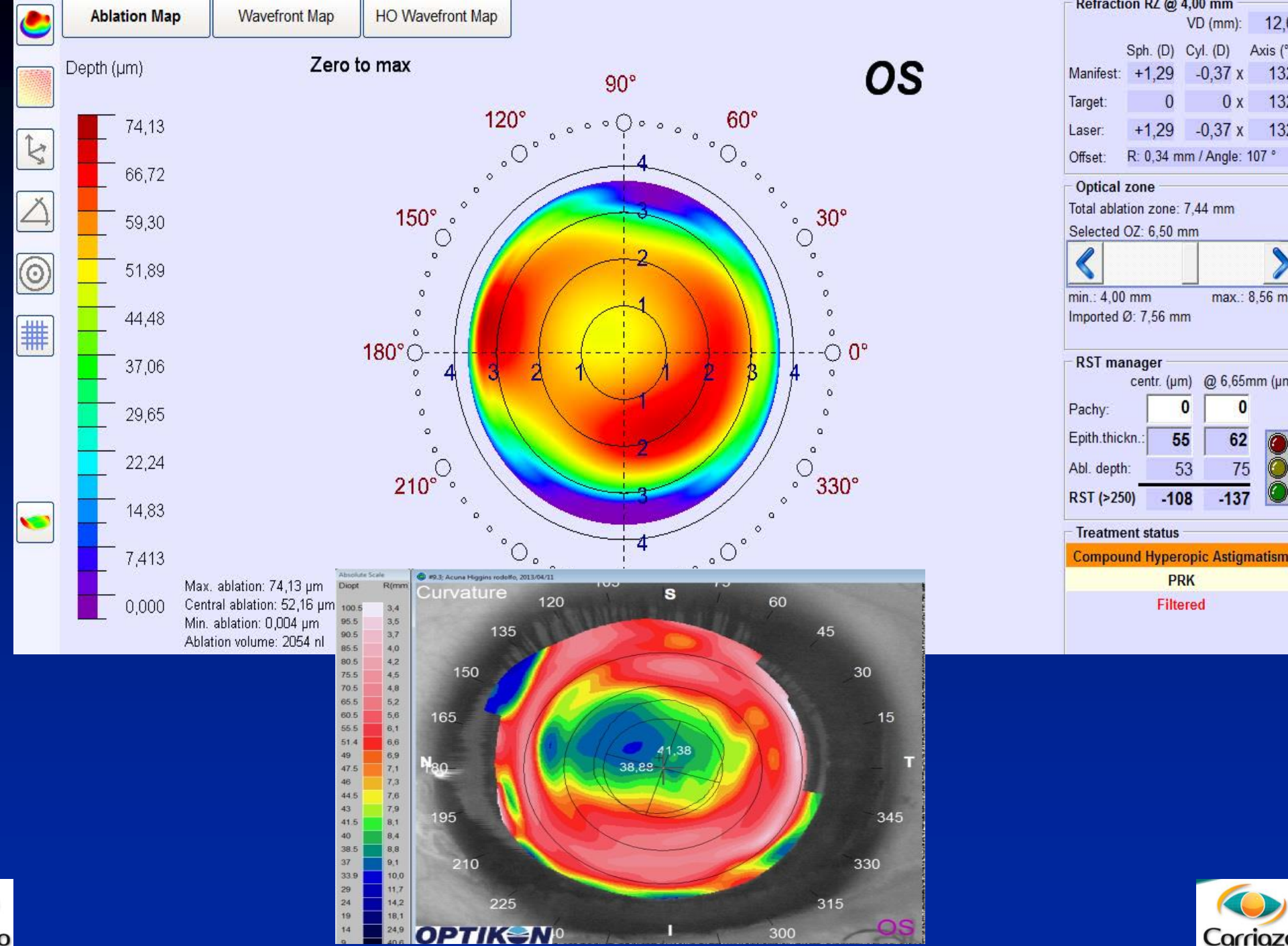
Current: Max. ablation: 82 μm, Ablation volume: 2423 nl

Preview: Max. ablation: 74 μm [-9%], Ablation volume: 2055 nl [-15%]

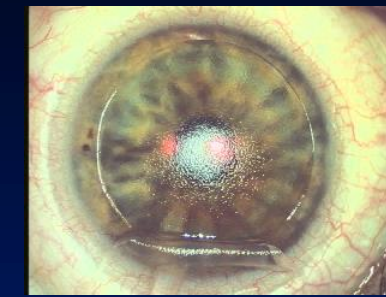
Residual: Min. difference: -1 μm [-1%], Max. difference: 20 μm [+24%], Volume difference: 368 nl [+15%]

Minimize | Minimize +

Depth | Volume | Depth | Volume | Update preview



Alternative treatments for residual refractive errors after Cataract Surgery



Piggyback

Light-adjustable lens

Corneal treatment

Piggyback insertion of a toric ICL appears to be effective and predictable in correcting refractive error in pseudophakic eyes.

J Refract Surg. 2010 Oct;26(10):766-9. Correction of residual refractive error in pseudophakic eyes with the use of a secondary piggyback toric Implantable Collamer Lens. Kojima T, Horai R, Hara S, Nakamura H, Nakamura T, Satoh Y, Ichikawa K.

Residual myopia errors up to -1.5 D were successfully corrected with precision and significant improvement in UCVA and without compromising BCVA using the LAL technology.

Ophthalmology. 2009 Aug;116(8):1432-5. Correction of myopia after cataract surgery with a light-adjustable lens. Chayet A, Sandstedt C, Chang S, Rhee P, Tsuchiyama B, Grubbs R, Schwartz D. Codet Vision Institute, Tijuana, Mexico. arturo.chayet@codetvision.com



CORNEAL SURGERY

RELAXING SURGERY

CK

KERATOMILEUSIS



RELAXING SURGERY

KERATOTOMY

RADIAL

ASTYGMATIC

FENTOSECOND

Ophthalmology. 2001 Jul;108(7):1269-74. Factors that influence the surgical effects of astigmatic keratotomy after cataract surgery. Inoue T, Maeda N, Sasaki K, Watanabe H, Inoue Y, Nishida K, Inoue Y,

Even with a uniform surgical procedure, the surgical effects of AK in eyes with against-the-rule astigmatism can be affected by the amount of preoperative astigmatism and the intraoperative axis misalignment. Adding the amount of preoperative astigmatism to the nomogram and improvement of surgical procedures will be required to obtain better surgical predictability of AK following cataract surgery.



KERATOMILEUSIS

SURFACE

INTRASTROMAL

PRK

LASEK

EPILASIK

LASIK

LASAK

Excimer laser corneal surgery for fine-tuning residual ametropia in pseudophakic patients is a safe and predictable alternative, with both PRK and LASIK showing good results in recent published literature.

Refractive enhancement following presbyopia-correcting intraocular lens implantation Marian Sue Macsaia, Bruno Machado Fontesca

Current Opinion in Ophthalmology 2008, 19:18-21





| Guell Artisan. Lasik ajustable precut para garantizar buena calidad optica Zona Optica 6.5 Ophthalmology
Volume 108, Issue 5, May 2001, Pages 945-952

- » R Zaldivar, J.M Davidorf, S Oscherow *et al.*
- » Combined posterior chamber phakic intraocular lens and laser in situ keratomileusisbiotics for extreme myopia
- » J Refract Surg, 15 (1999), pp. 299-308



Kunihiro Nagahara first introduced the phaco chop technique in 1993 at the annual meeting of the American Society of Cataract and Refractive Surgery (ASCRS) in Seattle, Washington.

Steve Arshinoff presented his "slice and separate" modified phaco chop technique at the 1997 annual meeting of the American Society of Cataract and Refractive Surgery. C This method is designed to be used for moderately dense nuclei. Dr Arshinoff describes impaling the nucleus and

FIGURES 19.18A TO C: Stop and chop (Courtesy: Dr Agarwal's Eye Hospital, India)

CRATER DIVIDE AND CONQUER (CDC) TECHNIQUE

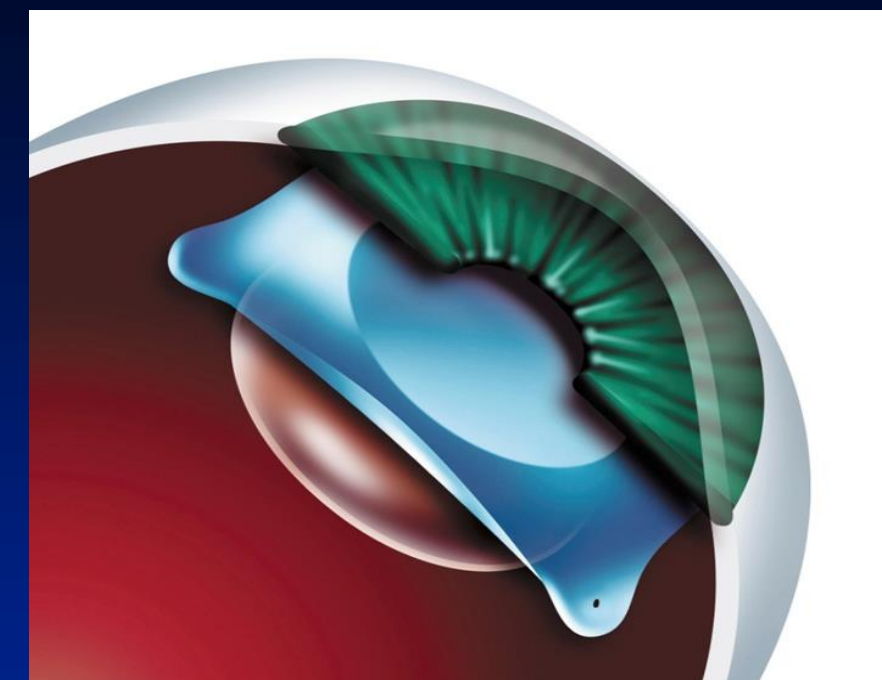
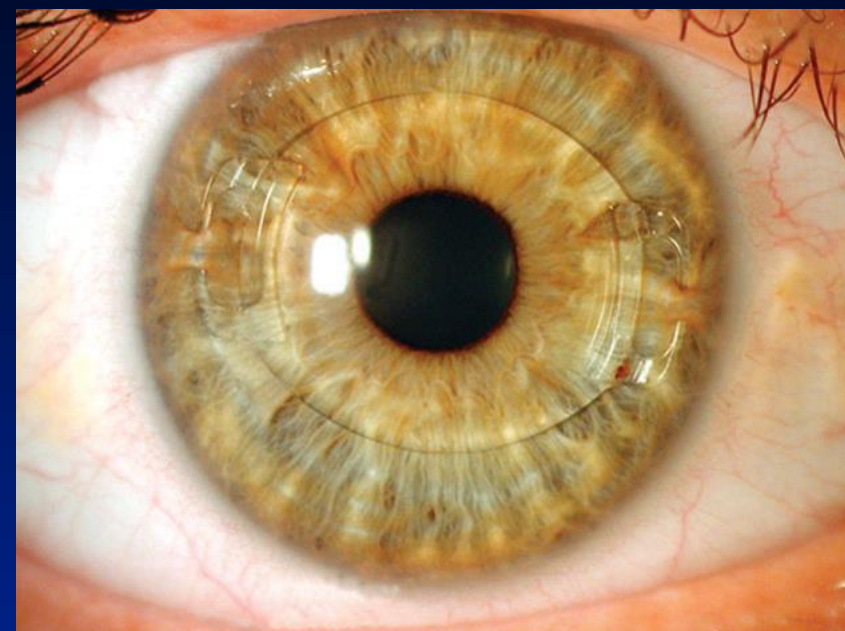
Divide and conquer nucleofractis phaco, described by the author was the first nucleofractis (two-instrument) cracking technique developed.^{1, 12} It is still used for hard lenses and is now combined with the phaco chop for dense brunescens nuclei. The phaco chop technique will be discussed later in this chapter.

HACO SWEEP

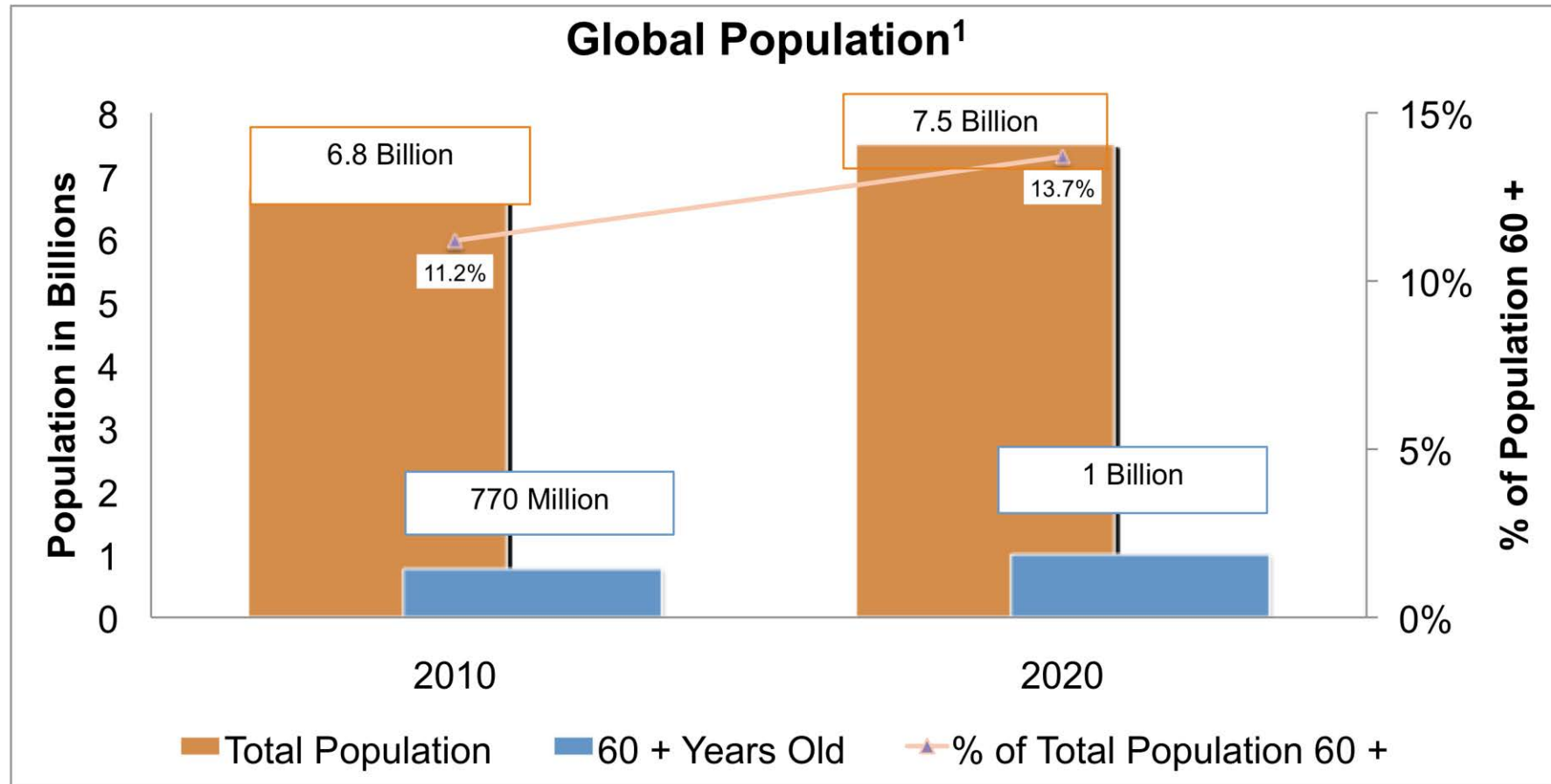
Another variation on the theme of sculpting is a technique the author calls "phaco sweep".¹

MULTIDIRECTIONAL DIVIDE AND CONQUER (MDC) TECHNIQUE

Down-slope multidirectional nucleofractis is begun by debulking the superior part of the lens.



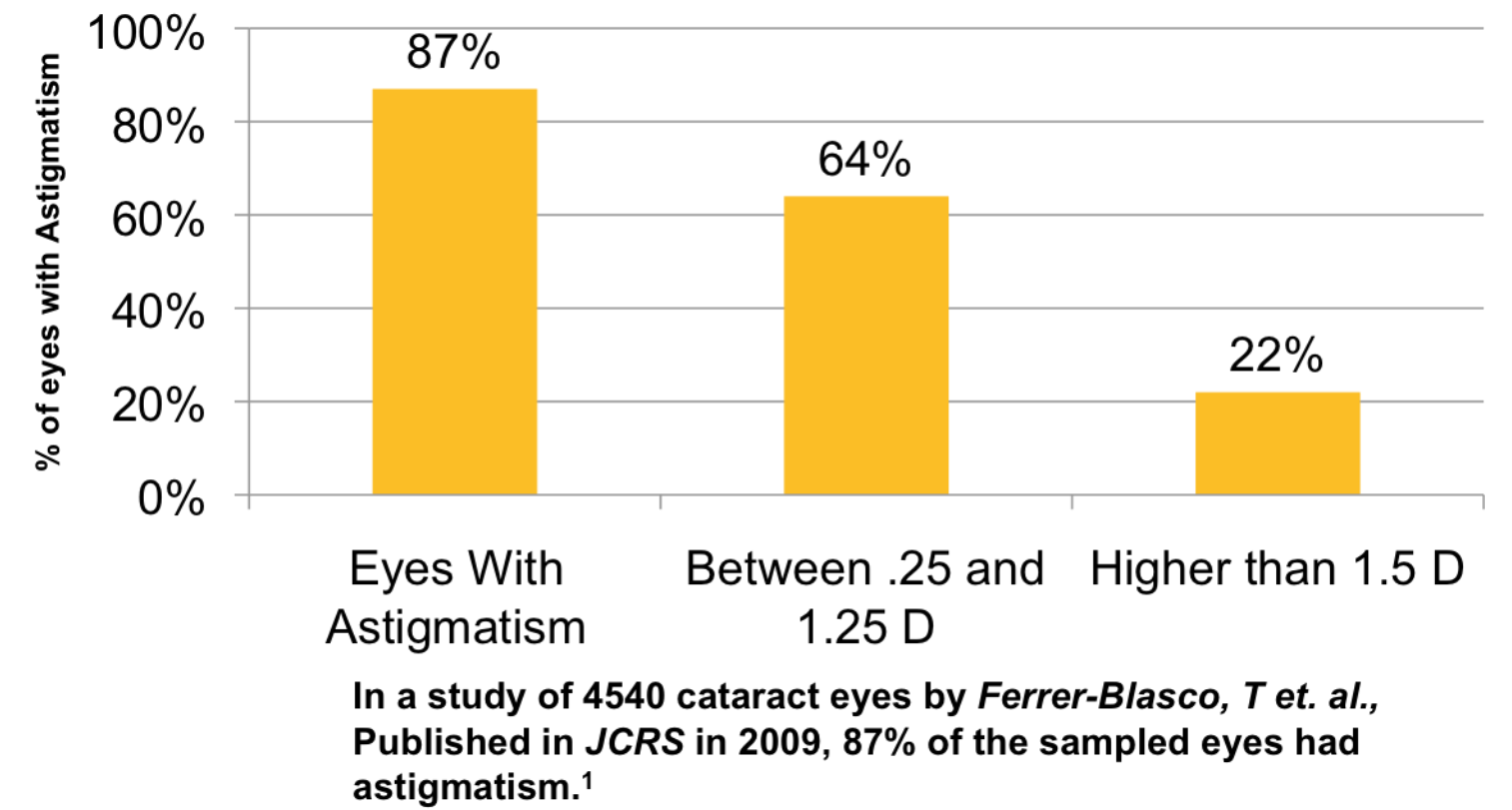
Aging Population



Sources:
1. United Nations World Population Estimates & Market Scope LLC

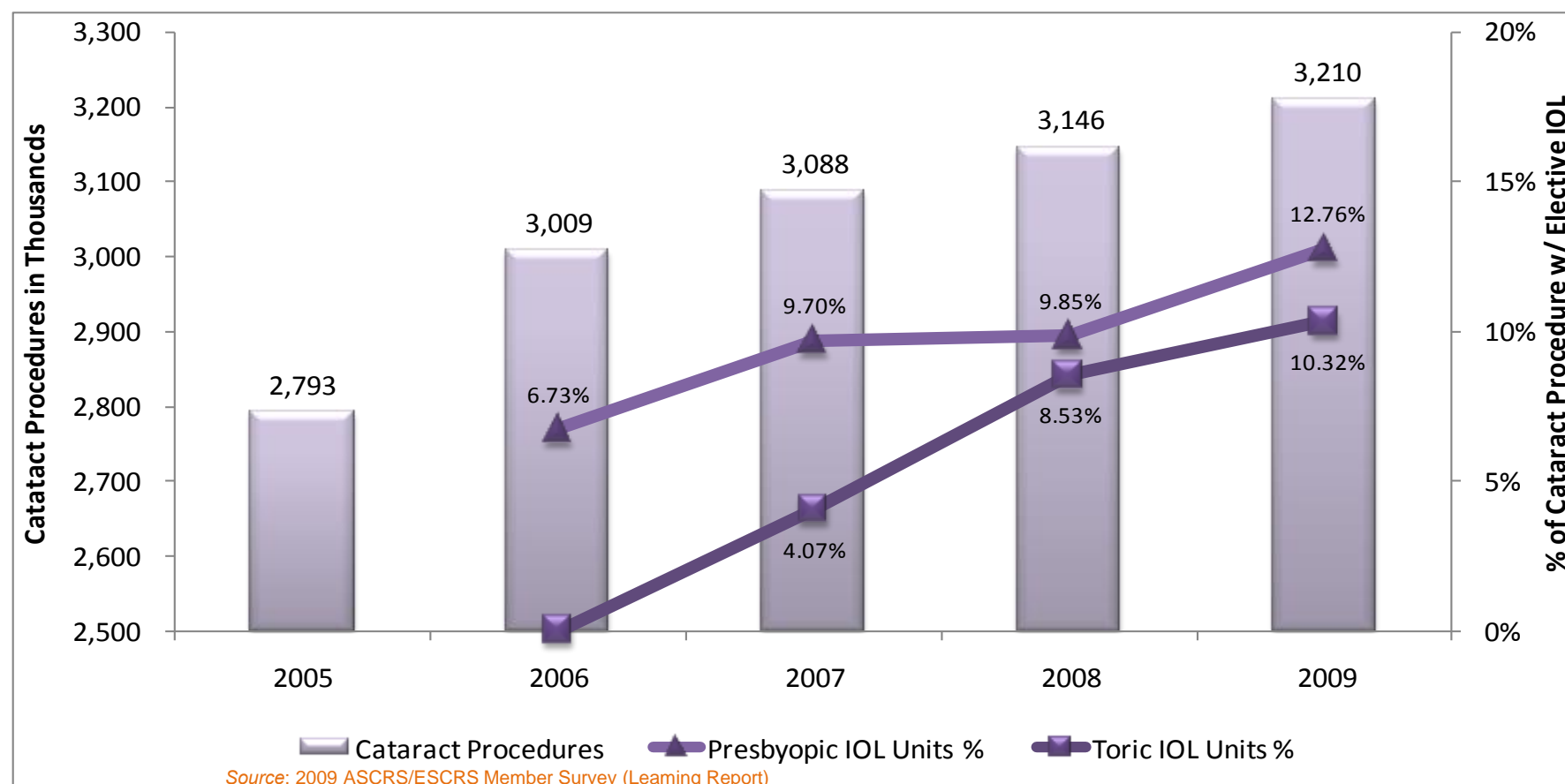
For International (Non-USA) Use Only

Cataract Surgery and Astigmatism



Sources:
1. Ferrer-Blasco T, Montés-Micó R, Peixoto-de-Matos SC, González-Méijome JM, Cerviño A. Prevalence of corneal astigmatism before cataract surgery. J Cataract Refract Surg. 2009 Jan;35(1):70-5. N = 4540 eyes

Cataract Procedure Volume - ASCRS



Source: 2009 ASCRS/ESCRS Member Survey (Learning Report)

For International (Non-USA) Use Only



KERATOMILEUSIS

SURFACE

PRK

LASEK

EPILASIK

INTRASTROMAL

LASIK

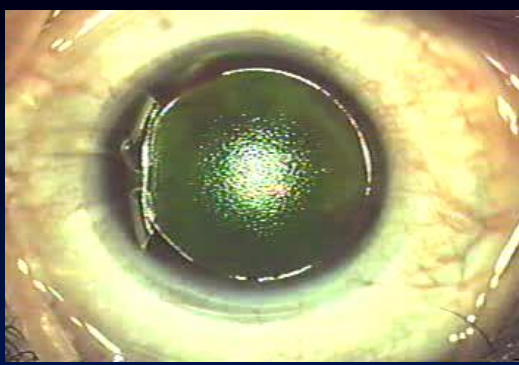
LASAK

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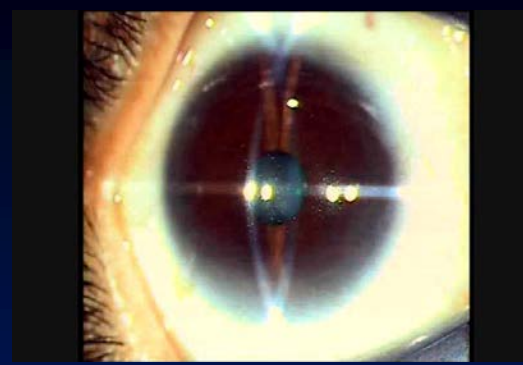
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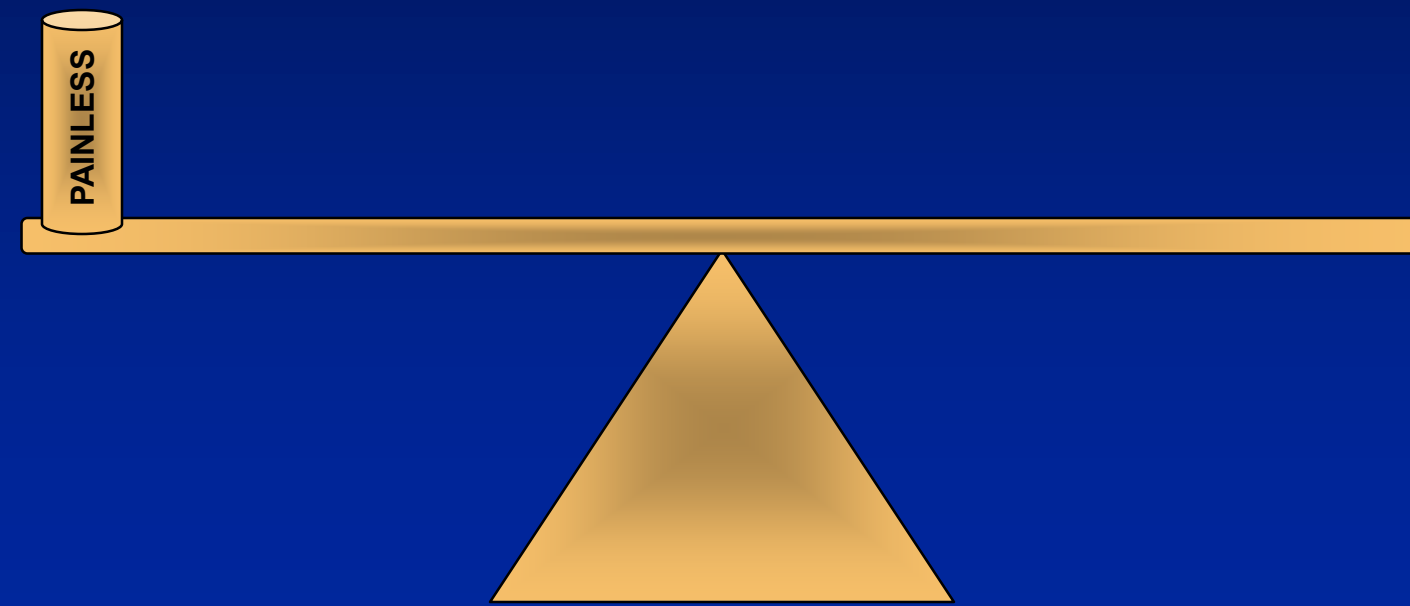




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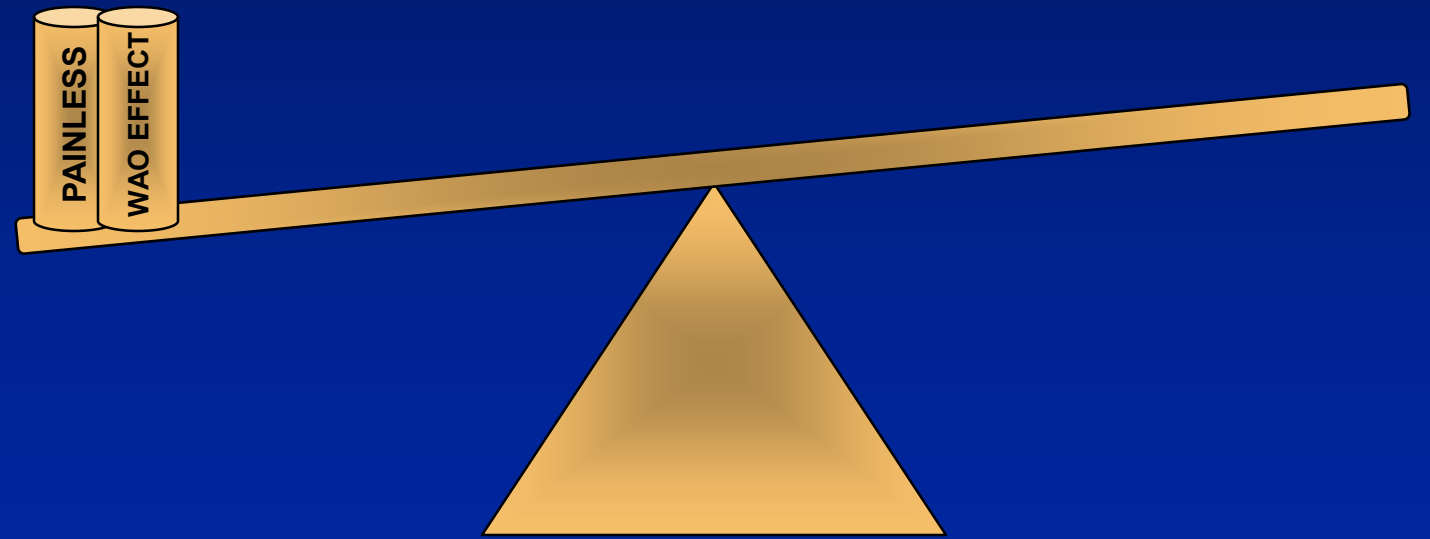


SURFACE



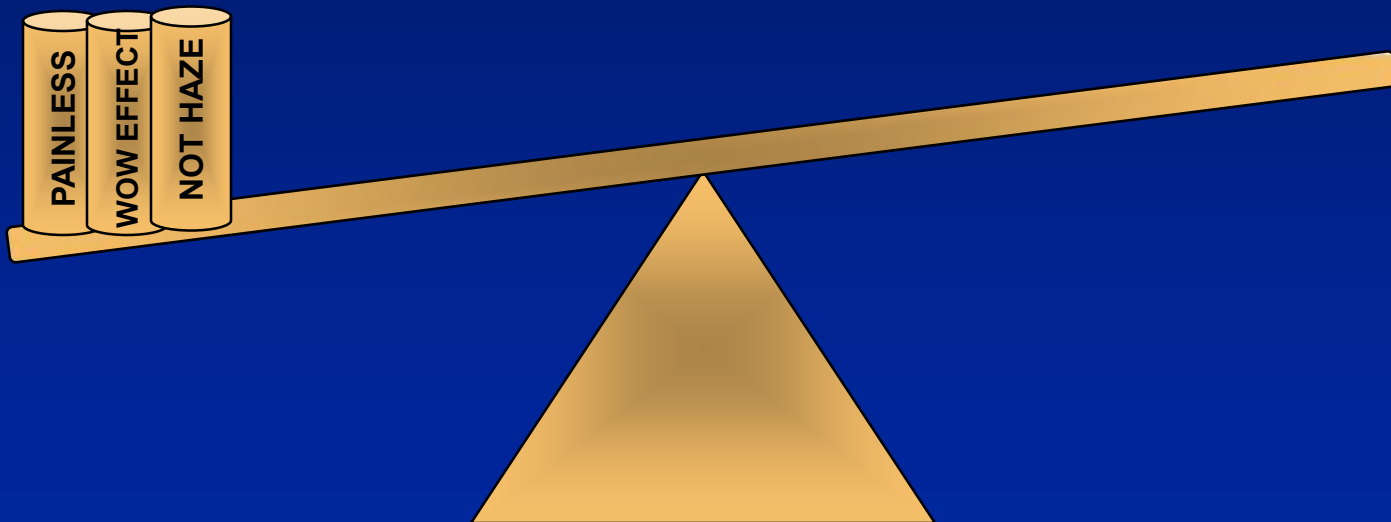
INTRASTROMAL

SURFACE



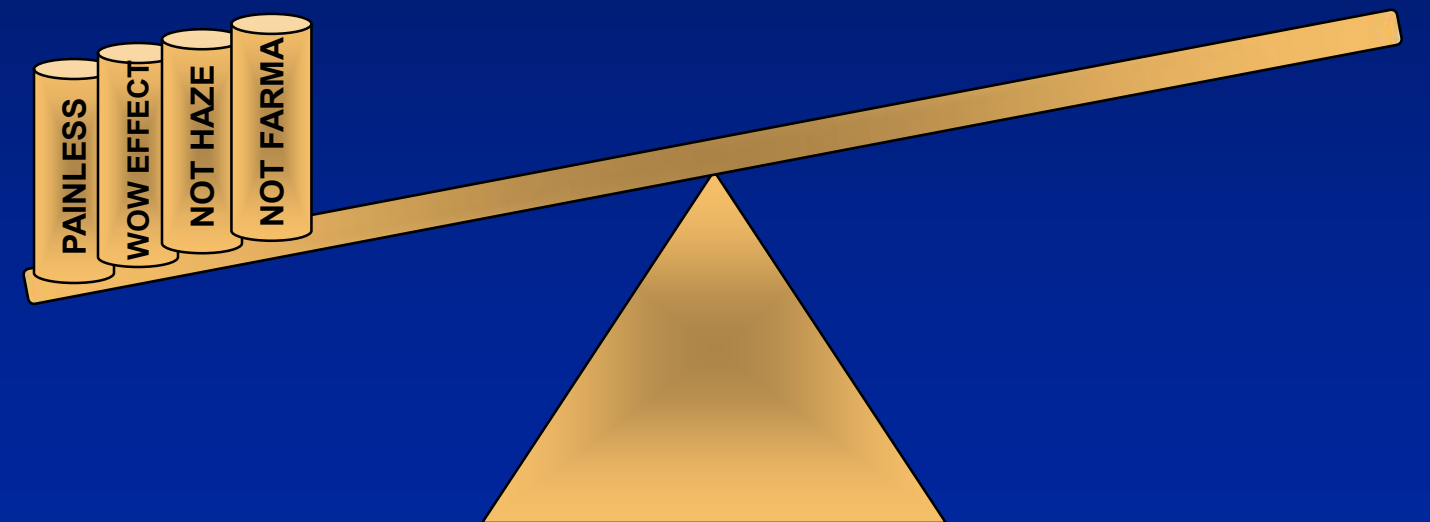
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SURFACE



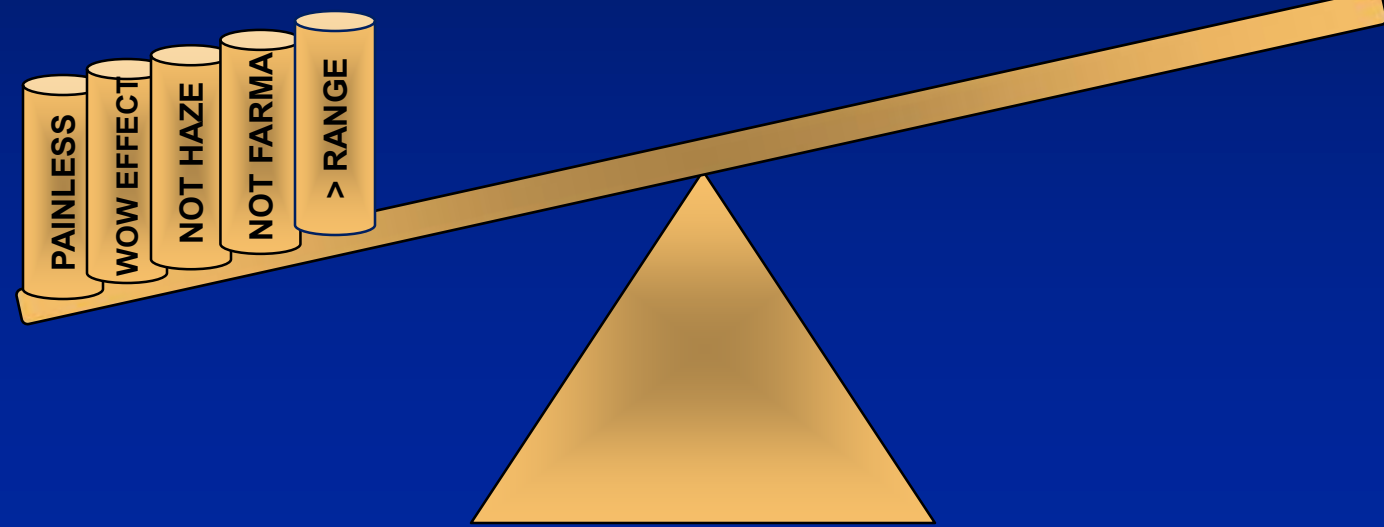
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SURFACE



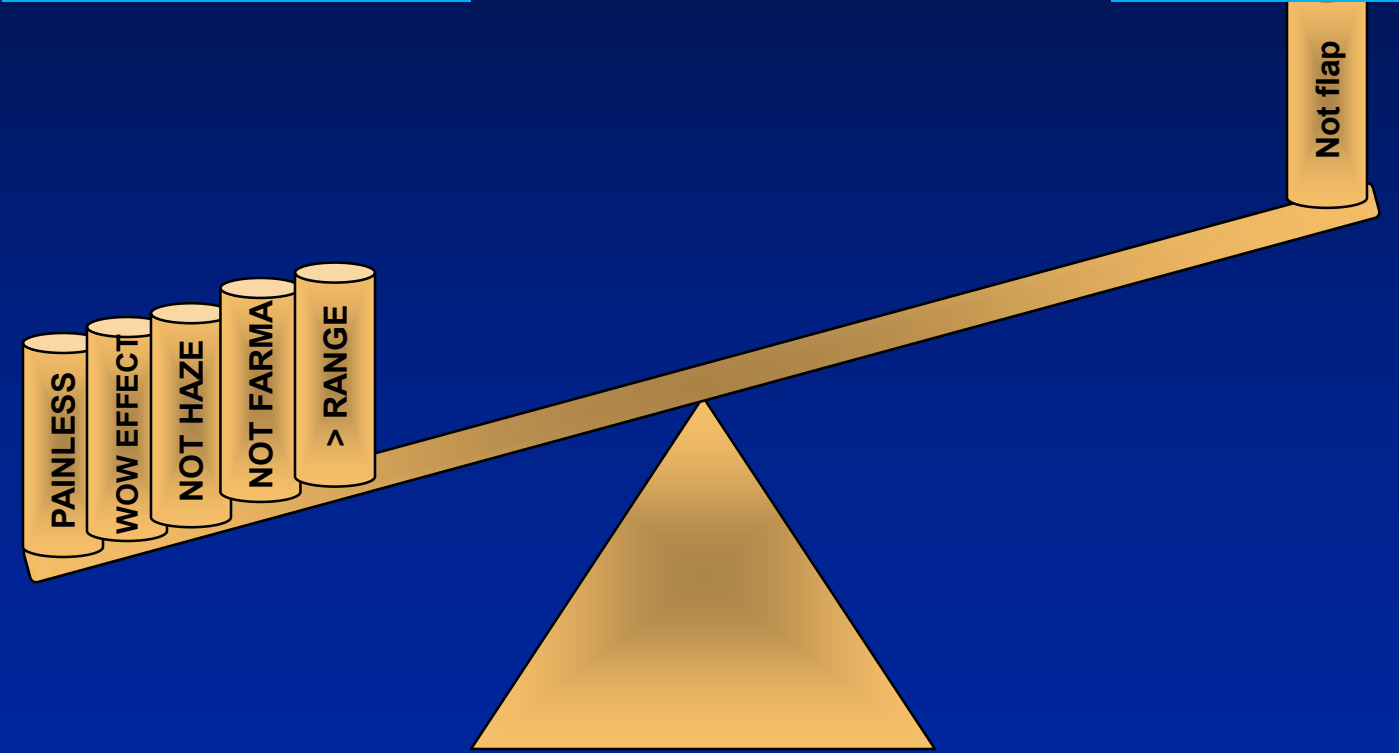
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SURFACE



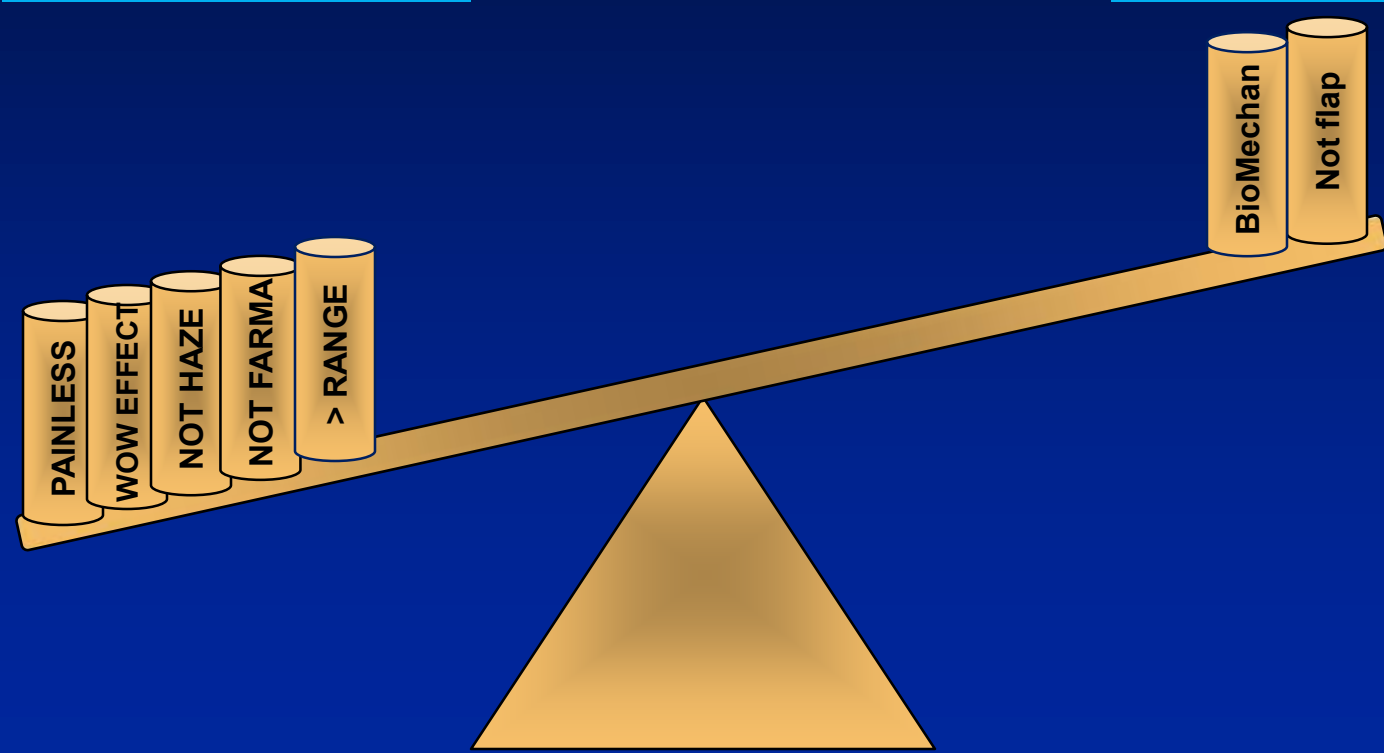
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SURFACE



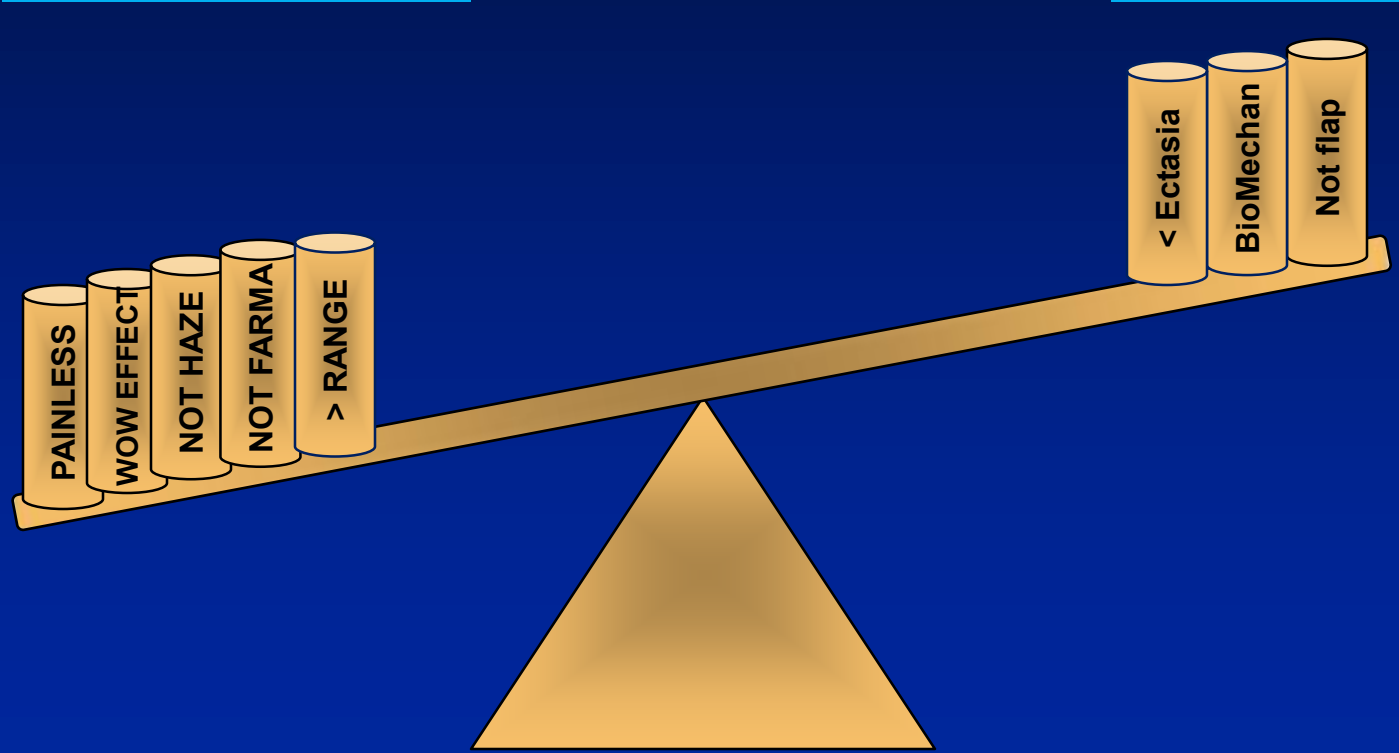
INTRASTROMAL

SURFACE



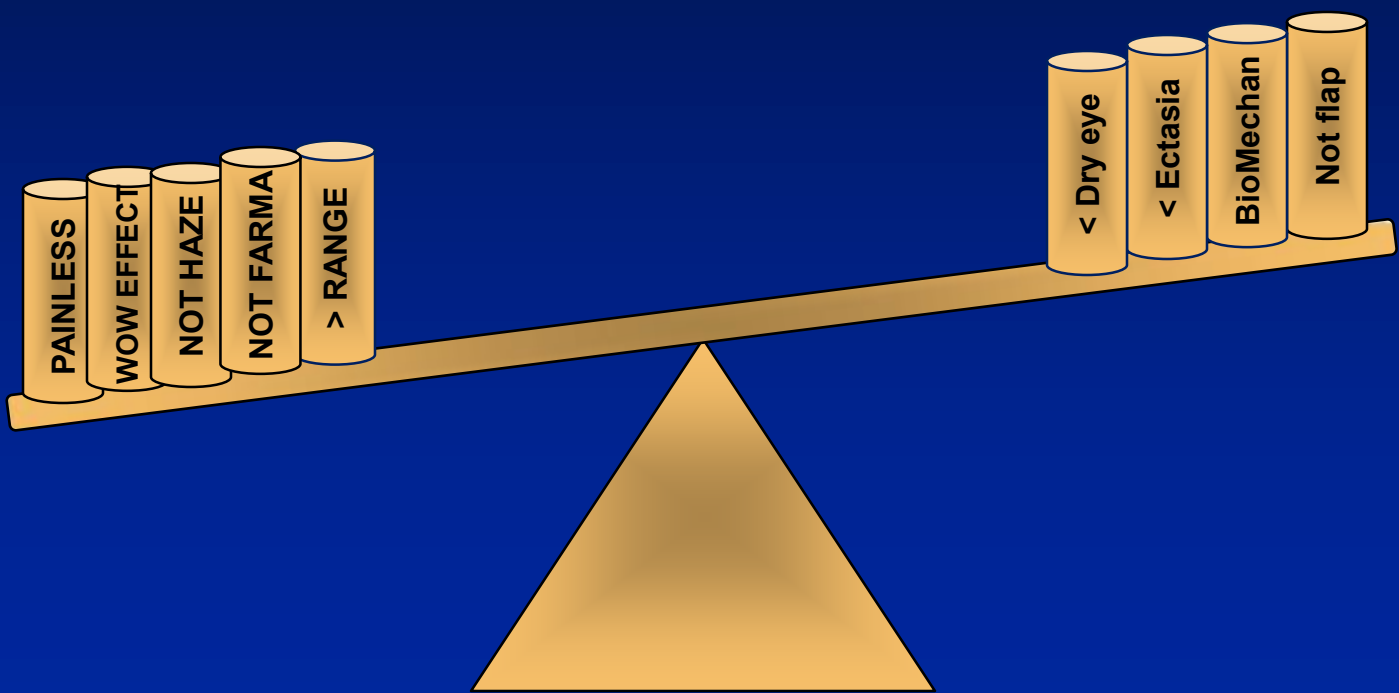
INTRASTROMAL

SURFACE



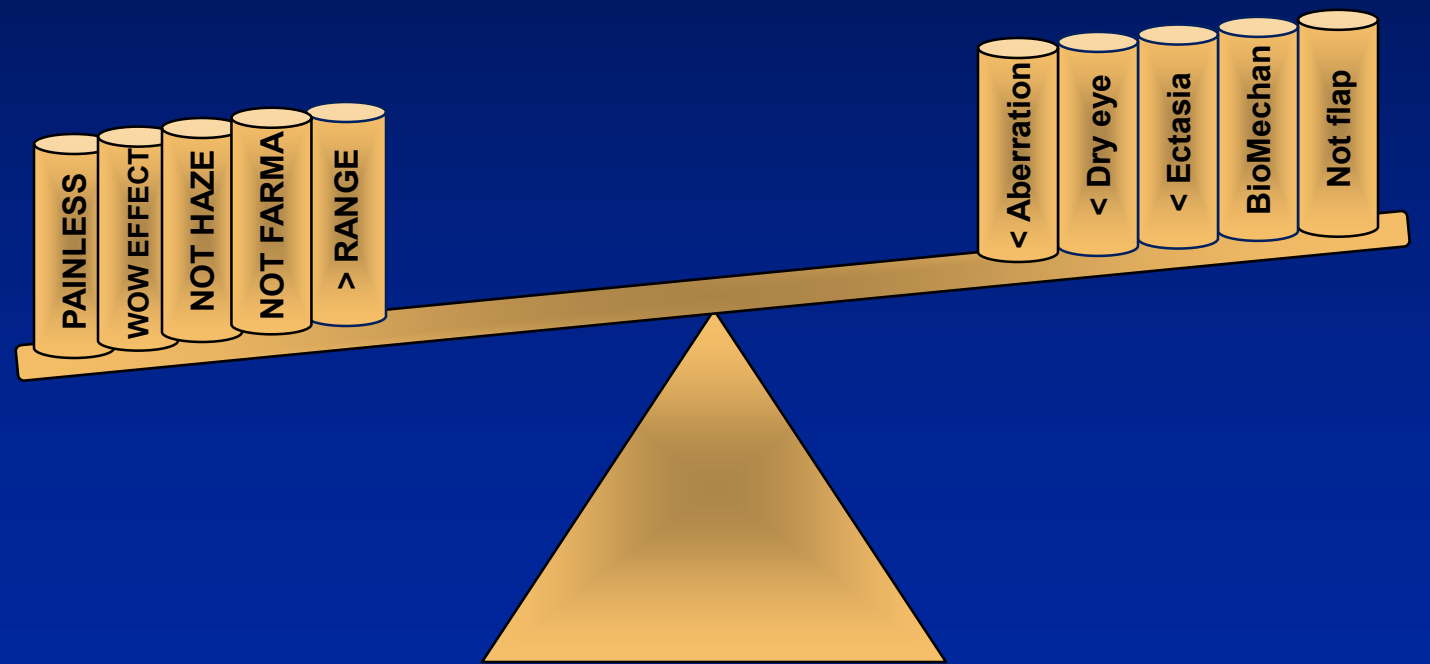
INTRASTROMAL

SURFACE



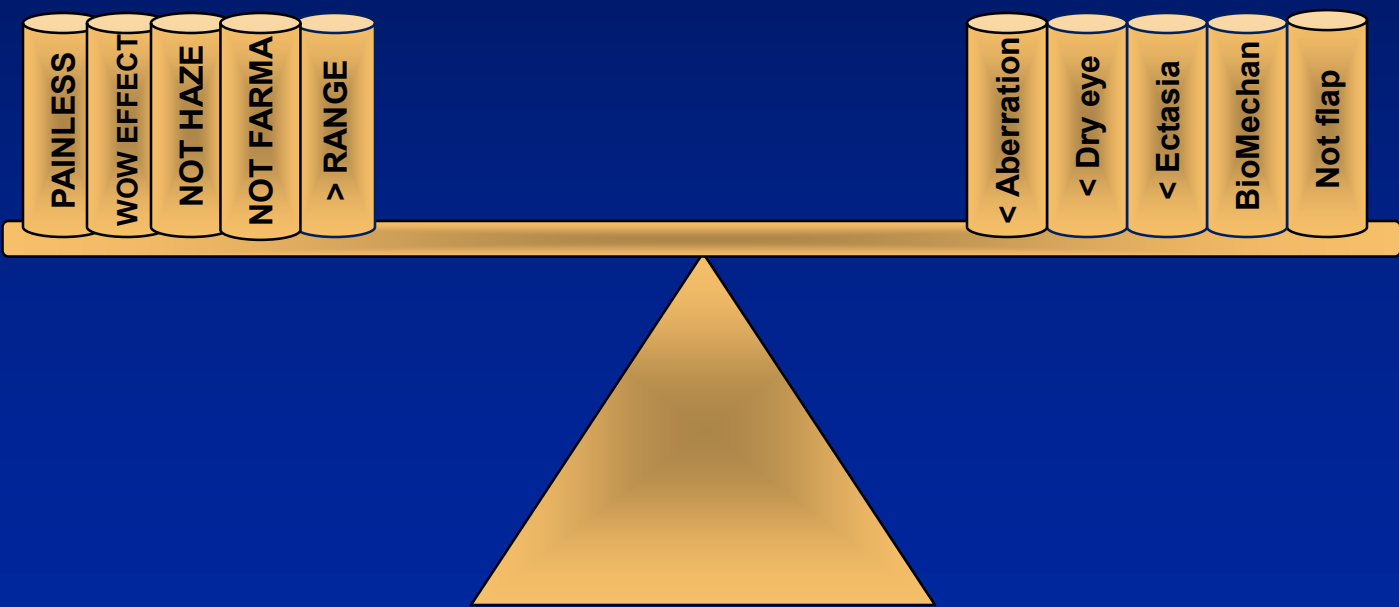
INTRASTROMAL

SURFACE

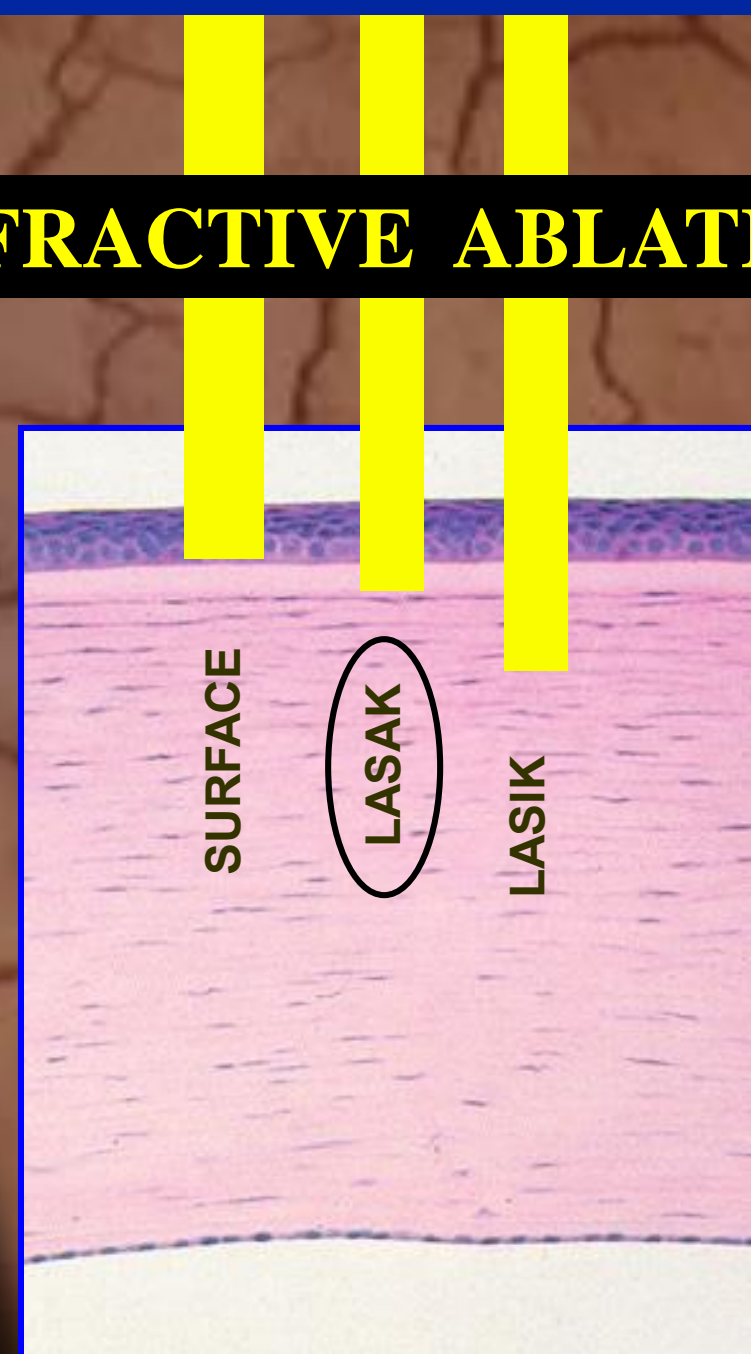


INTRASTROMAL

SURFACE

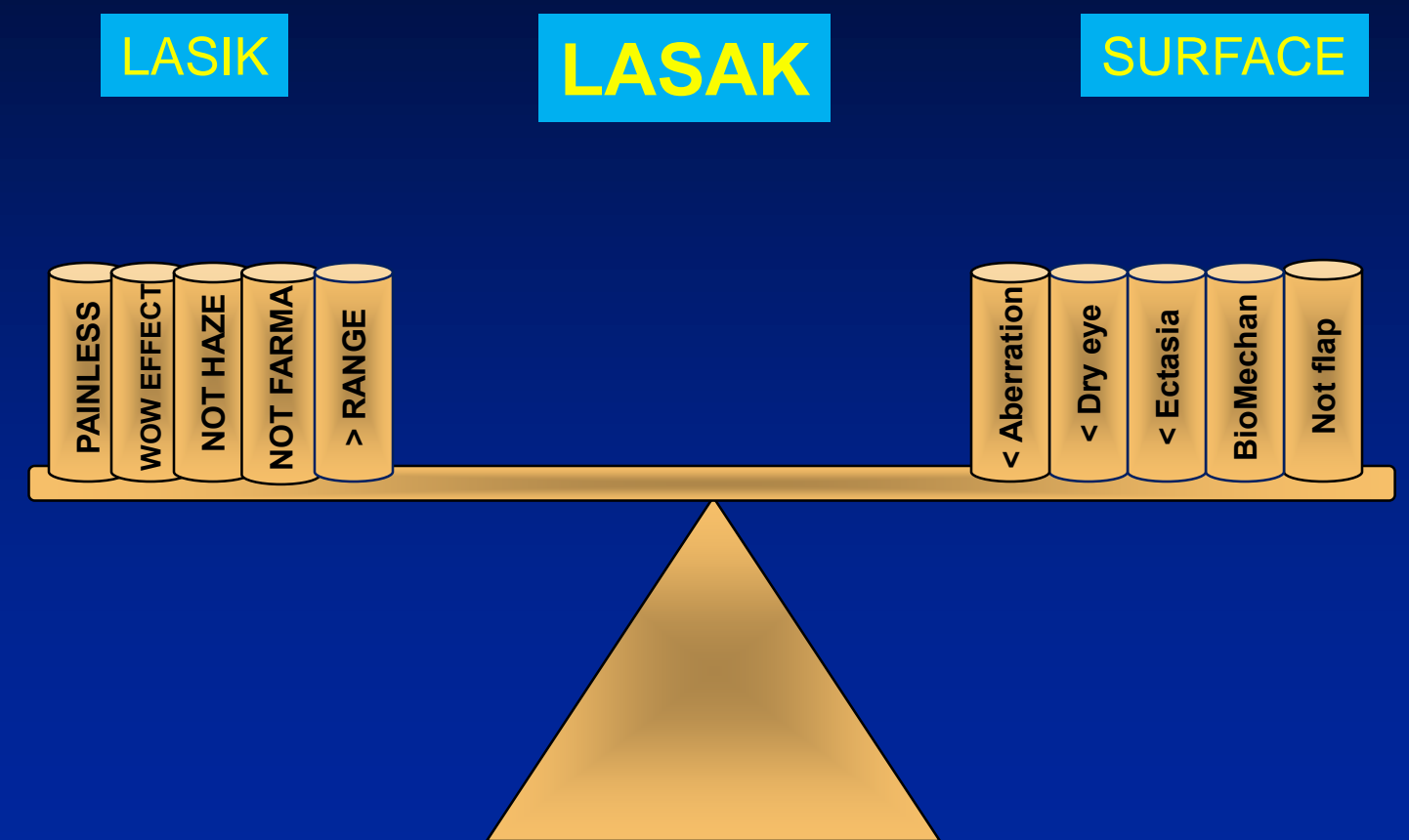
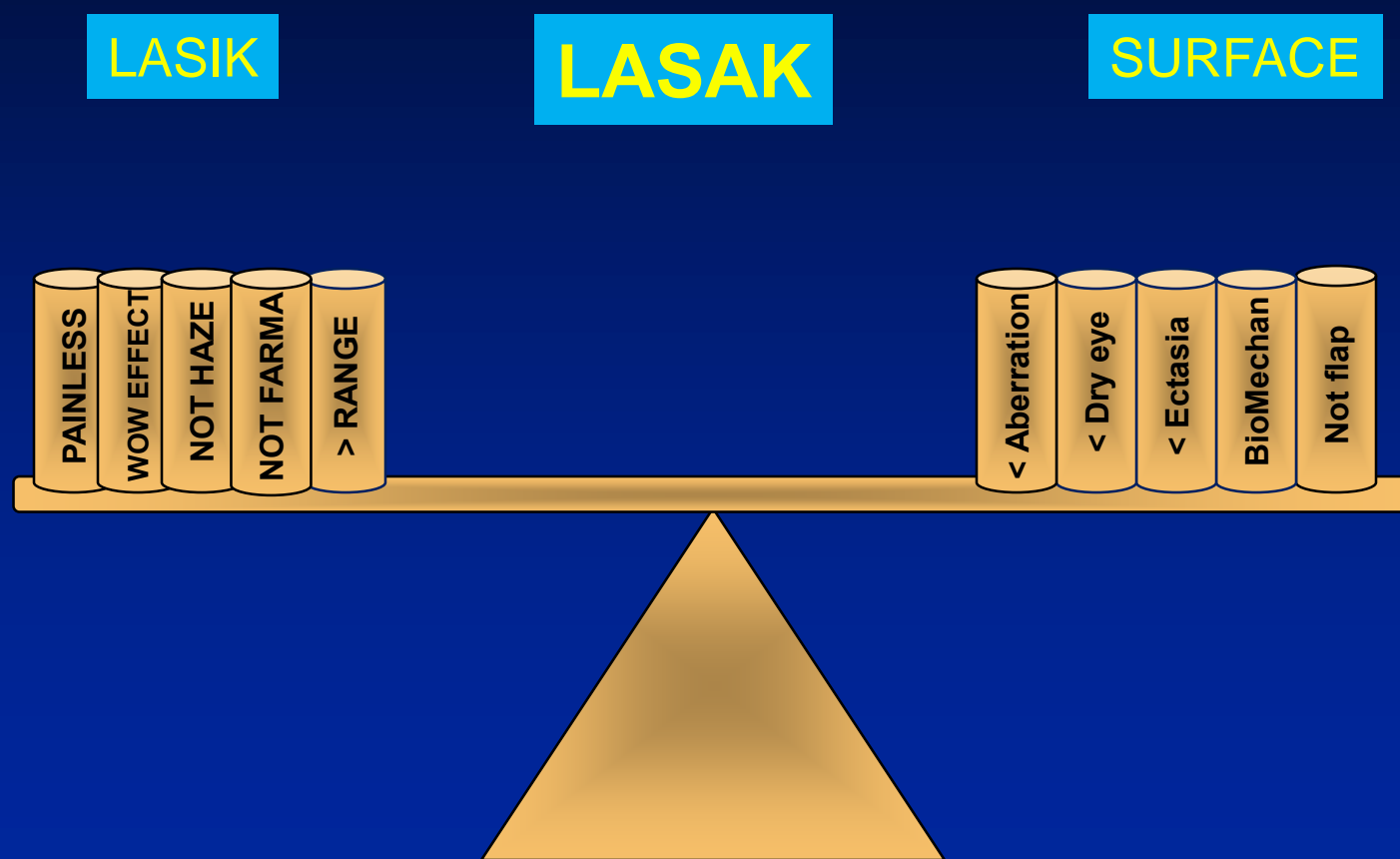


REFRACTIVE ABLATION



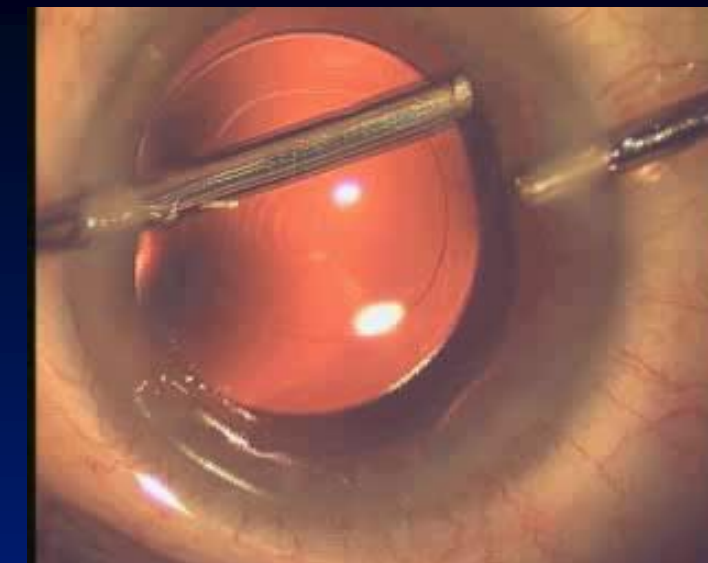
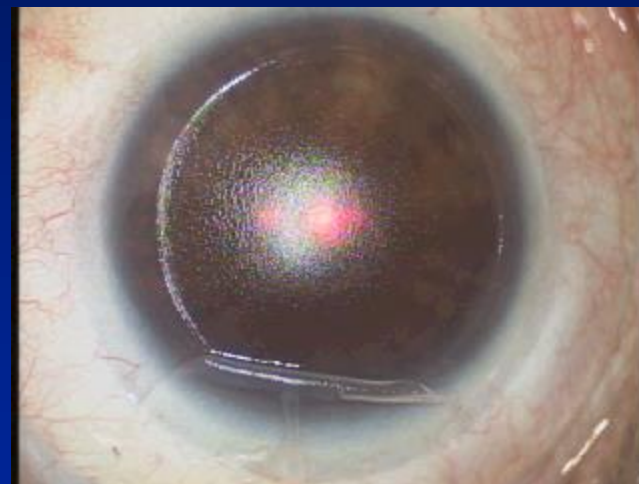
INTRASTROMAL Vs SURFACE

INTRASTROMAL Vs SURFACE



Asferic

Wavefront



Excimer laser corneal surgery for fine-tuning residual ametropia in pseudophakic patients is a safe and predictable alternative, with both PRK and LASIK showing good results in recent published literature.

Few studies specifically address corneal laser surgery to refine refractive outcome in eyes implanted with presbyopia-correcting IOLs. In addition, there is no published study comparing standard vs. customized ablations in these patients.

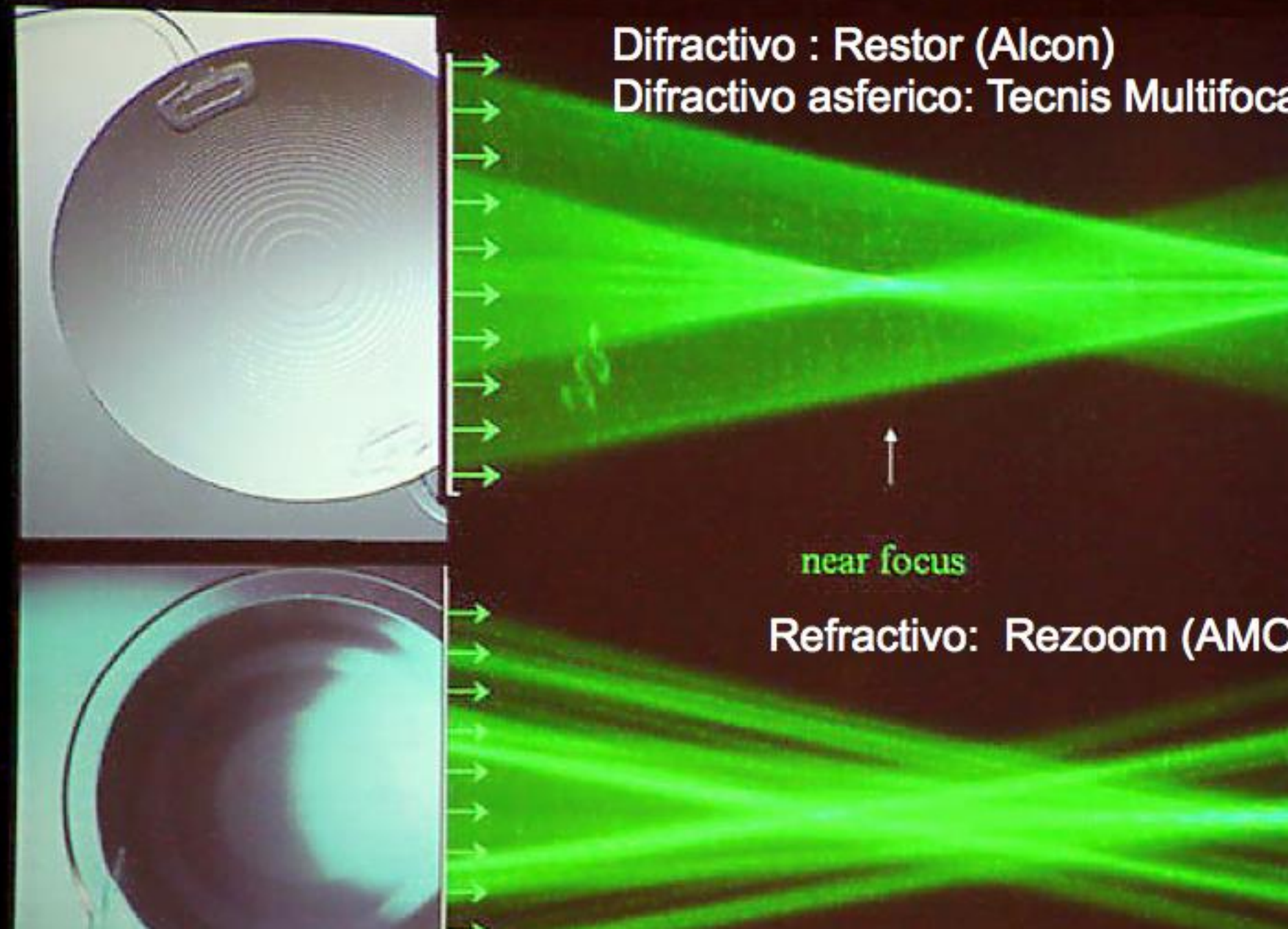
*Refractive enhancement following presbyopia-correcting intraocular lens implantation Marian Sue Macsaia,b and Bruno Machado Fontesca
Current Opinion in Ophthalmology 2008, 19:18– 21*



Diffractive

Vs

Refractive



ReSTOR® IOL¹

Tecnis ZM900

ReZoom

ReSTOR®

Crystalens

SCHWIND Custom Ablation Manager Amaris

PatientID: 22420444 Lastname: GUARIN DIAZ Firstname: SILVIA
Date of Birth: 9/5/1952 Sex: Female Imported File: none

Manifest refraction @ 12.0 mm
Sphere [D] Cylinder [D] Axis [°]
+3.75 -2.00 x 110
Target Refraction
0 0 x 110

Laser Settings SCA @ 12.0 mm
RZ = 4.00 mm
+3.75 -2.00 x 110

Total ablation zone = 7.16 mm
Selected OZ = 6.00 mm
min = 4.00 mm max = 7.95 mm

Treatment selection
Hyperopia astigmatism
LASIK

RST Manager
Pachy: 541 µm
Flap thickness: 130 µm
Max. Ablation: 51 µm
RST (>250): 360 µm

Aberration-Free
Ablation Map
Depth [microns]
50.6
46.7
42.8
38.9
35.1
31.2
27.3
23.4
19.5
15.6
11.7
7.8
3.9
0.0
Max. ablation = 50.63 microns
Central ablation = 0.00 microns
Ablation volume = 813.77 Nanolitres

3D
Wireframe
Axes
Angle
Circles
Grid

OD

ORX-CAM
PALK-CAM
Comparison
Open
Save
Print
Settings
Language
Help
Info
Exit

Apply Export



SCHWIND Custom Ablation Manager Amaris

PatientID: **GU202807** Lastname: **Guarin Diaz** Firstname: **Silvia**
 Date of Birth: **5/9/1952** Sex: **Female** Imported File: **Guarin_Diaz_GU20280**

OD **OS**

Ocular Wavefront

3D **Ablation Map** Wavefront Map HO Wavefront Map

Wireframe Axes Angle Circles Grid

Depth [microns] scale: 0.0 to 34.7

Manifest refraction @ 0.0 mm
 Sphere [D] Cylinder [D] Axis [°]
 +3.42 -2.41 x 105

Target Refraction: 0 0 x 105

Laser Settings SCA @ 0.0 mm
 RZ = 4.00 mm
 +3.42 -2.41 x 105

Total ablation zone = 7.17 mm
 Selected OZ = 6.00 mm

min = 4.00 mm max = 6.67 mm
 Imported Ø = 5.56 mm

Treatment selection
 Hyperopia astigmatism
 LASIK
 Extended

RST Manager
 Pachy: 530 µm
 Flap thickness: 130 µm
 Max. Ablation: 35 µm
 RST (>250): 365 µm

Max. ablation = 34.70 microns
 Central ablation = 0.07 microns
 Ablation volume = 561.98 Nanolitres

ORK-CAM PALK-CAM Comparison Open Save Print Settings Language Help Info Exit

Patient data Zernike list Aberration info Manager Apply **Export**

SCHWIND Custom Ablation Manager Amaris

PatientID: **22420444** Lastname: **GUARIN DIAZ** Firstname: **SILVIA**
 Date of Birth: **9/5/1952** Sex: **Female** Imported File: **none**

OD **OS**

Aberration-Free

3D **Ablation Map**

Wireframe Axes Angle Circles Grid

Depth [microns] scale: 0.0 to 23.4

Manifest refraction @ 12.0 mm
 Sphere [D] Cylinder [D] Axis [°]
 +1.75 -1.50 x 90

Target Refraction: 0 0 x 90

Laser Settings SCA @ 12.0 mm
 RZ = 4.00 mm
 +1.75 -1.50 x 90

Total ablation zone = 6.41 mm
 Selected OZ = 6.00 mm

min = 4.00 mm max = 9.05 mm

Treatment selection
 Hyperopia astigmatism
 LASIK

RST Manager
 Pachy: 530 µm
 Flap thickness: 130 µm
 Max. Ablation: 24 µm
 RST (>250): 376 µm

Max. ablation = 23.35 microns
 Central ablation = 0.00 microns
 Ablation volume = 255.58 Nanolitres

ORK-CAM PALK-CAM Comparison Open Save Print Settings Language Help Info Exit

Patient data Apply **Export** Exit

SCHWIND Custom Ablation Manager Amaris

PatientID: **22420444** Lastname: **GUARIN DIAZ** Firstname: **SILVIA**
 Date of Birth: **9/5/1952** Sex: **Female** Imported File: **none**

OD **OS**

Aberration-Free

3D **Ablation Map**

Wireframe Axes Angle Circles Grid

Depth [microns] scale: 0.0 to 23.4

Manifest refraction @ 12.0 mm
 Sphere [D] Cylinder [D] Axis [°]
 +1.75 -1.50 x 90

Target Refraction: 0 0 x 90

Laser Settings SCA @ 12.0 mm
 RZ = 4.00 mm
 +1.75 -1.50 x 90

Total ablation zone = 6.41 mm
 Selected OZ = 6.00 mm

min = 4.00 mm max = 9.05 mm

Treatment selection
 Hyperopia astigmatism
 LASIK

RST Manager
 Pachy: 530 µm
 Flap thickness: 130 µm
 Max. Ablation: 24 µm
 RST (>250): 376 µm

Max. ablation = 23.35 microns
 Central ablation = 0.00 microns
 Ablation volume = 255.58 Nanolitres

ORK-CAM PALK-CAM Comparison Open Save Print Settings Language Help Info Exit

Patient data Apply **Export** Exit

SCHWIND Custom Ablation Manager Amaris

PatientID: **GU202807** Lastname: **Guarin Diaz** Firstname: **Silvia**
 Date of Birth: **5/9/1952** Sex: **Female** Imported File: **Guarin_Diaz_GU20280**

OD **OS**

Ocular Wavefront

3D **Ablation Map** Wavefront Map HO Wavefront Map

Wireframe Axes Angle Circles Grid

Depth [microns] scale: 0.0 to 22.2

Manifest refraction @ 0.0 mm
 Sphere [D] Cylinder [D] Axis [°]
 +1.84 -1.50 x 90

Target Refraction: 0 0 x 90

Laser Settings SCA @ 0.0 mm
 RZ = 4.00 mm
 +1.84 -1.50 x 90

Total ablation zone = 6.98 mm
 Selected OZ = 6.00 mm

min = 4.00 mm max = 7.21 mm
 Imported Ø = 6.01 mm

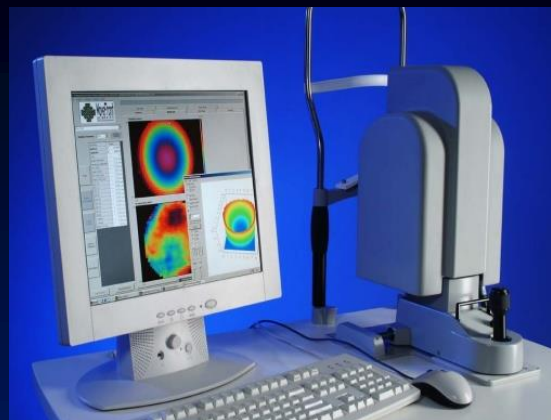
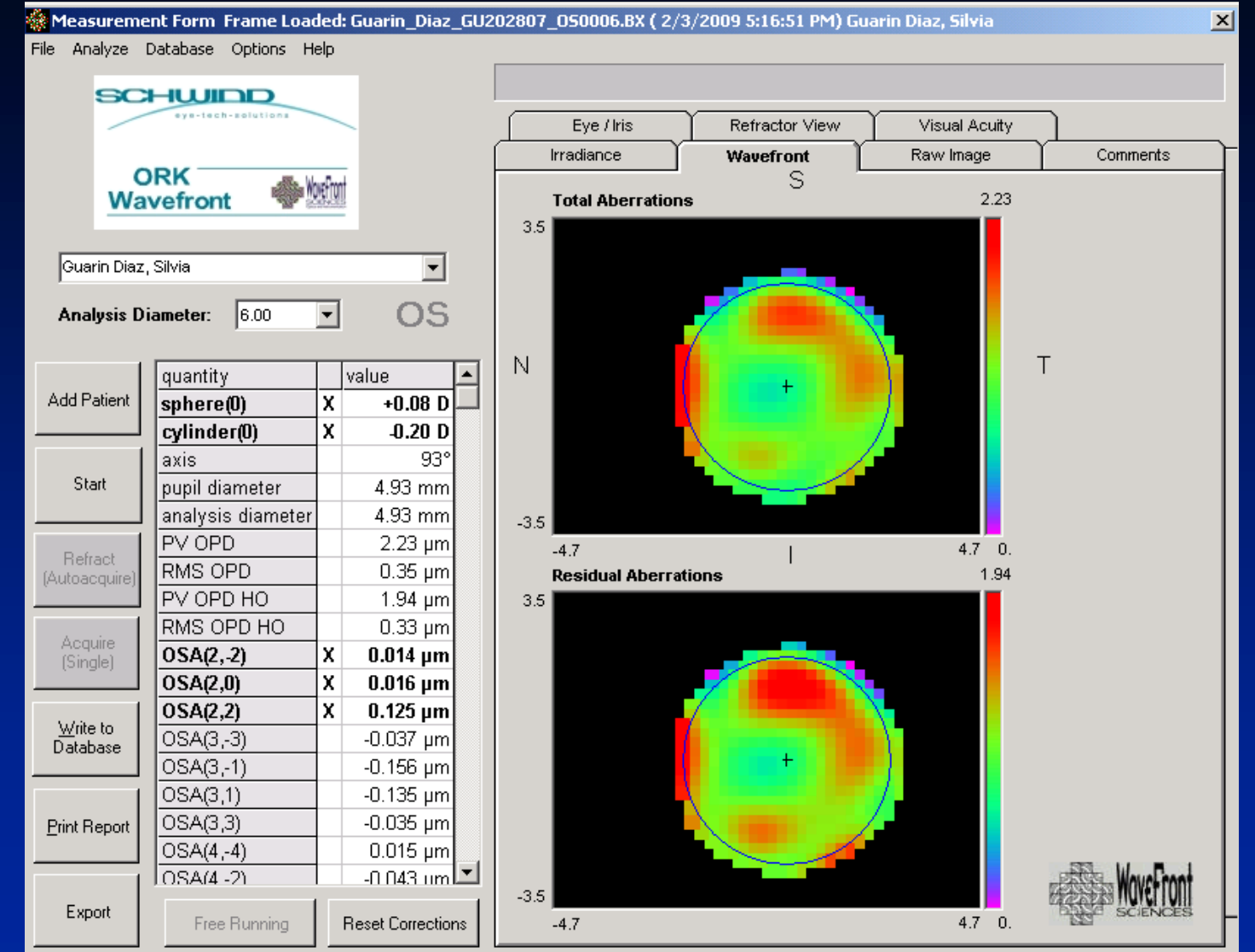
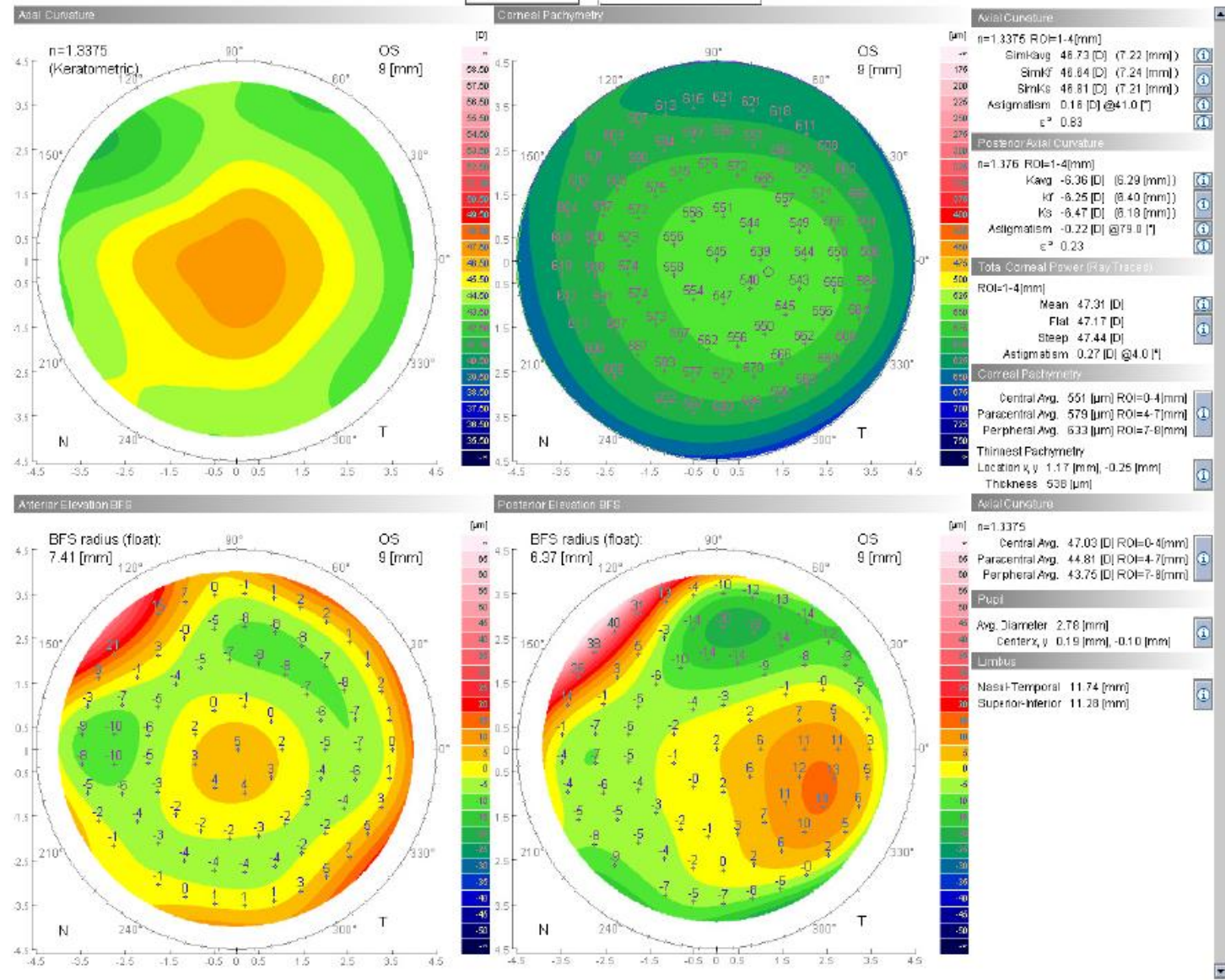
Treatment selection
 Hyperopia astigmatism
 LASIK

RST Manager
 Pachy: 530 µm
 Flap thickness: 130 µm
 Max. Ablation: 23 µm
 RST (>250): 377 µm

Max. ablation = 22.21 microns
 Central ablation = 3.16 microns
 Ablation volume = 367.90 Nanolitres

ORK-CAM PALK-CAM Comparison Open Save Print Settings Language Help Info Exit

Patient data Zernike list Aberration info Manager Apply **Export** Exit

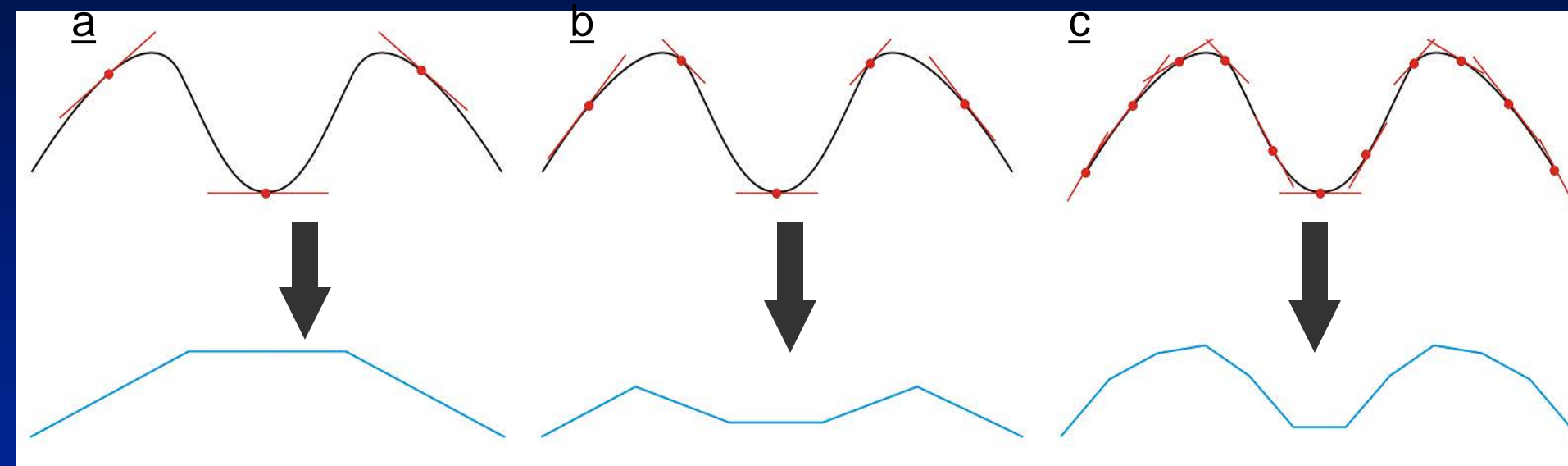
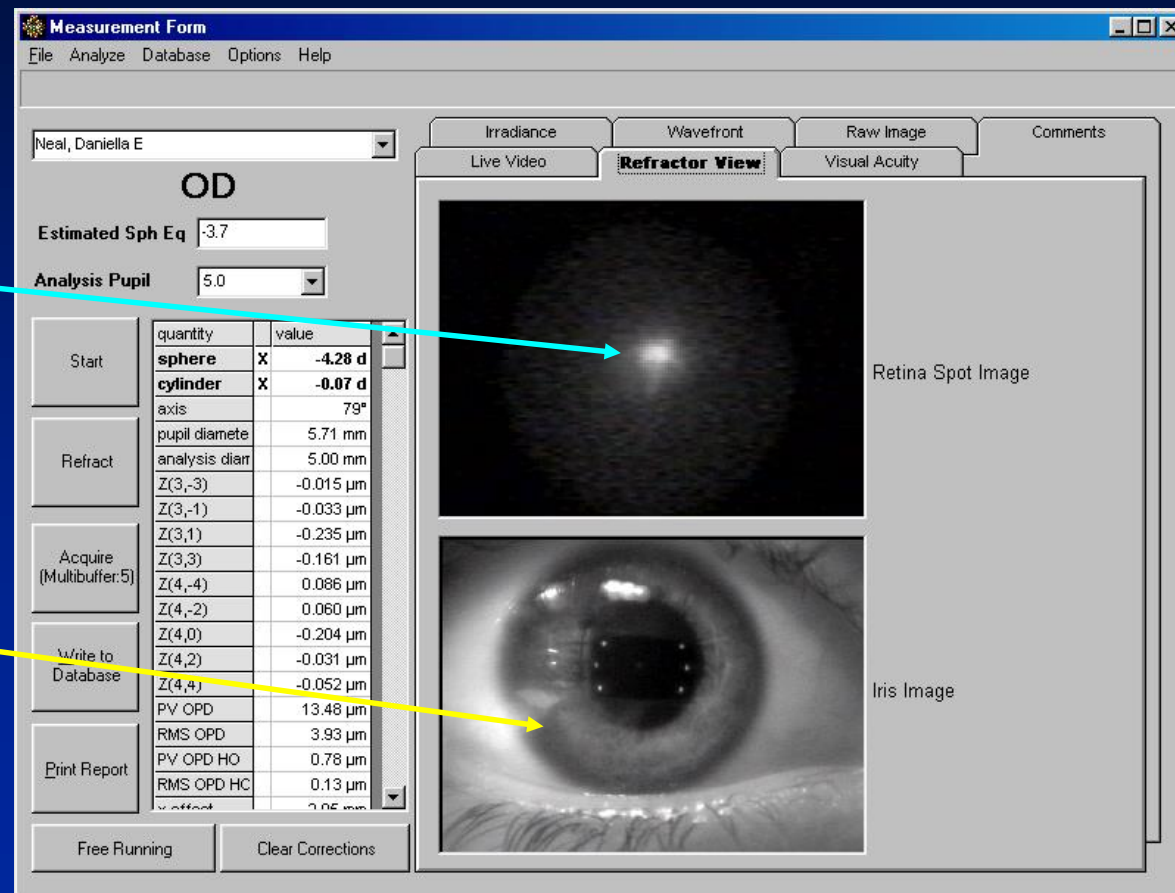


Wavefront- COAS

Shape & Amplitude Reconstruction

Laserbeam on the Retina

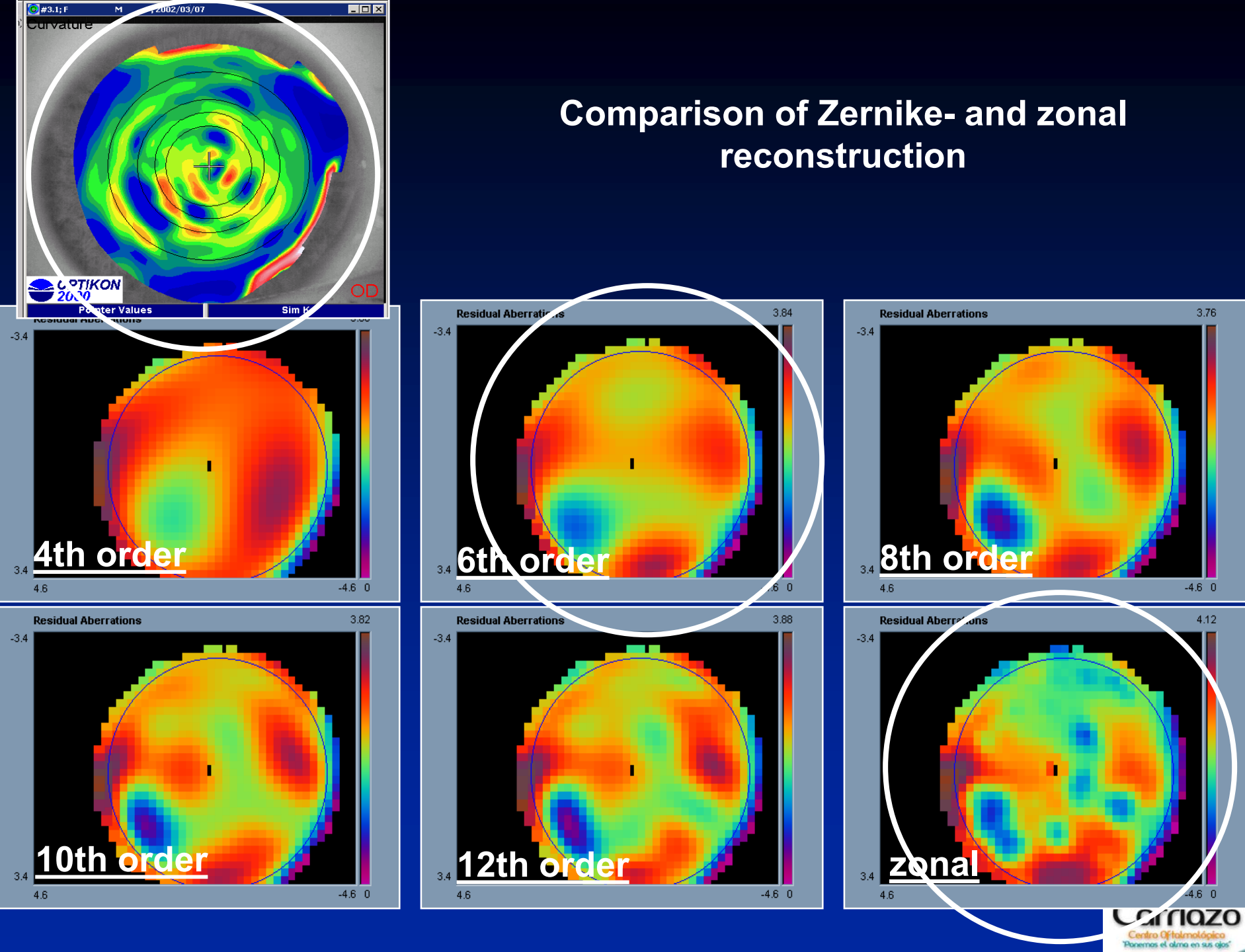
Iris image with focusing spots during the measurement



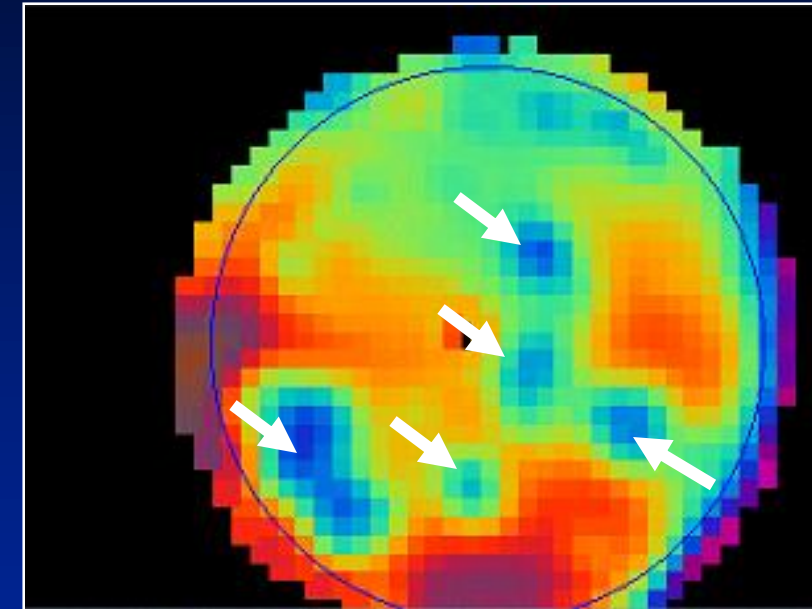
Reconstruction accuracy with different sensor resolutions

• High Resolution = More information = better diagnosis and better treatment out

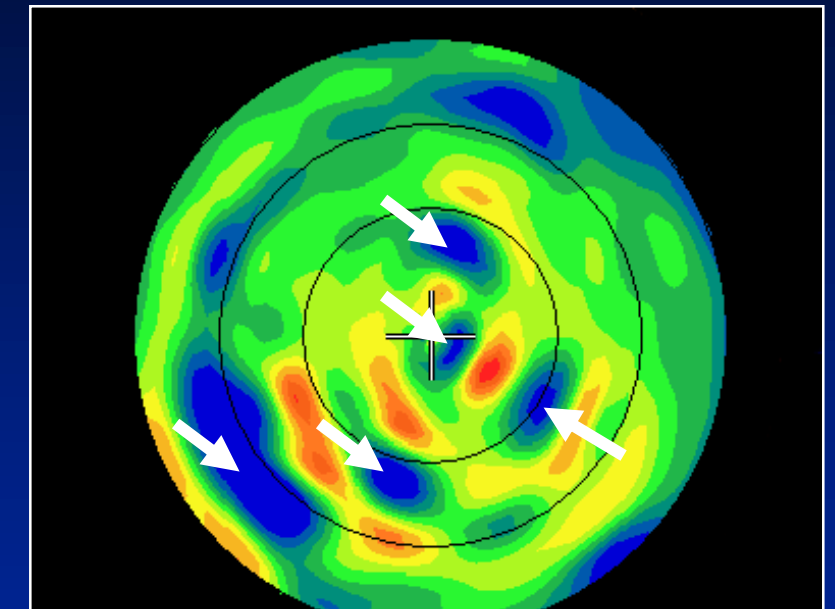
Comparison of Zernike- and zonal reconstruction



Corneal Scars

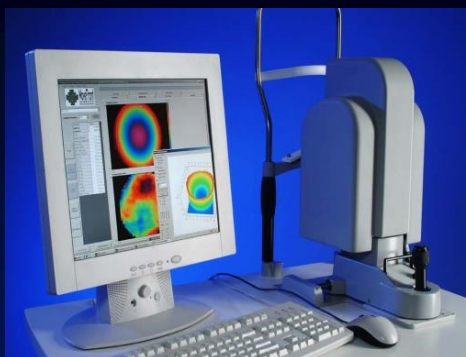


Wavefront zonal reconstruction



Corneal Topography Curvature

Comparison of wavefront zonal reconstruction and topography



0.2 – 1.3 μ



Spot : 600 μ

CONCLUSION

Excimer laser corneal surgery for residual ametropia in pseudophakic patients is a safe and predict-able alternative, with both PRK and LASIK.

Few studies specifically address corneal laser surgery to refine refractive outcome in eyes implanted with presbyopia- correcting IOLs. There is no published study comparing standard vs. customized ablations in these patients.

It is not known if available wavefront machines can reliably measure ocular aberrations in eyes with refractive and diffractive IOLs implants and give correct information for laser treatment. Further studies are warranted to help elucidate these questions.

*Refractive enhancement following presbyopia-correcting intraocular lens implantation Marian Sue Macsaia,b and Bruno Machado Fontesca
Current Opinion in Ophthalmology 2008, 19:18– 21*



Bioptics



Cornea Sana

Astigmatismo irregular

IOL Lio Faquicos Multifocal

Inestable Estable

Asferico Corneal wave Wavefront total

Asferico Corneal wave

Crosslinking

QX

PERSONAL

NO QX

QX



BIOPTICS

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