

Lasik Complications

Outline

- Preoperative.....
 1. Contra-indications
 2. Keratoconus detection
- Intraoperative.....
 3. Technology issues
 4. Flap making trouble: microkeratome / femtosecond
 5. Epithelial abrasion
 6. Buttonholes
 7. Decentered ablation
 8. Central Islands
- Postoperative.....
 9. Undercorrections / overcorrection
 10. Regression
 11. More flap trouble (folds, dislocation and loss)
 12. Dry eye
 13. Inflammation: DLK (SOS) TLS (Light sensitivity)
 14. Infection
 15. Epithelial invasion
 16. Quality of vision
 17. Management of irregular, small or decentered OZ
 18. Ectasia
 19. Glaucoma
 20. Retina
 21. Cataract (IOL calculation)

BEFORE THE SURGERY Preoperative Complications

1. Contra-Indications
2. Keratoconus detection

Pre-Operative

1. Contra-Indications

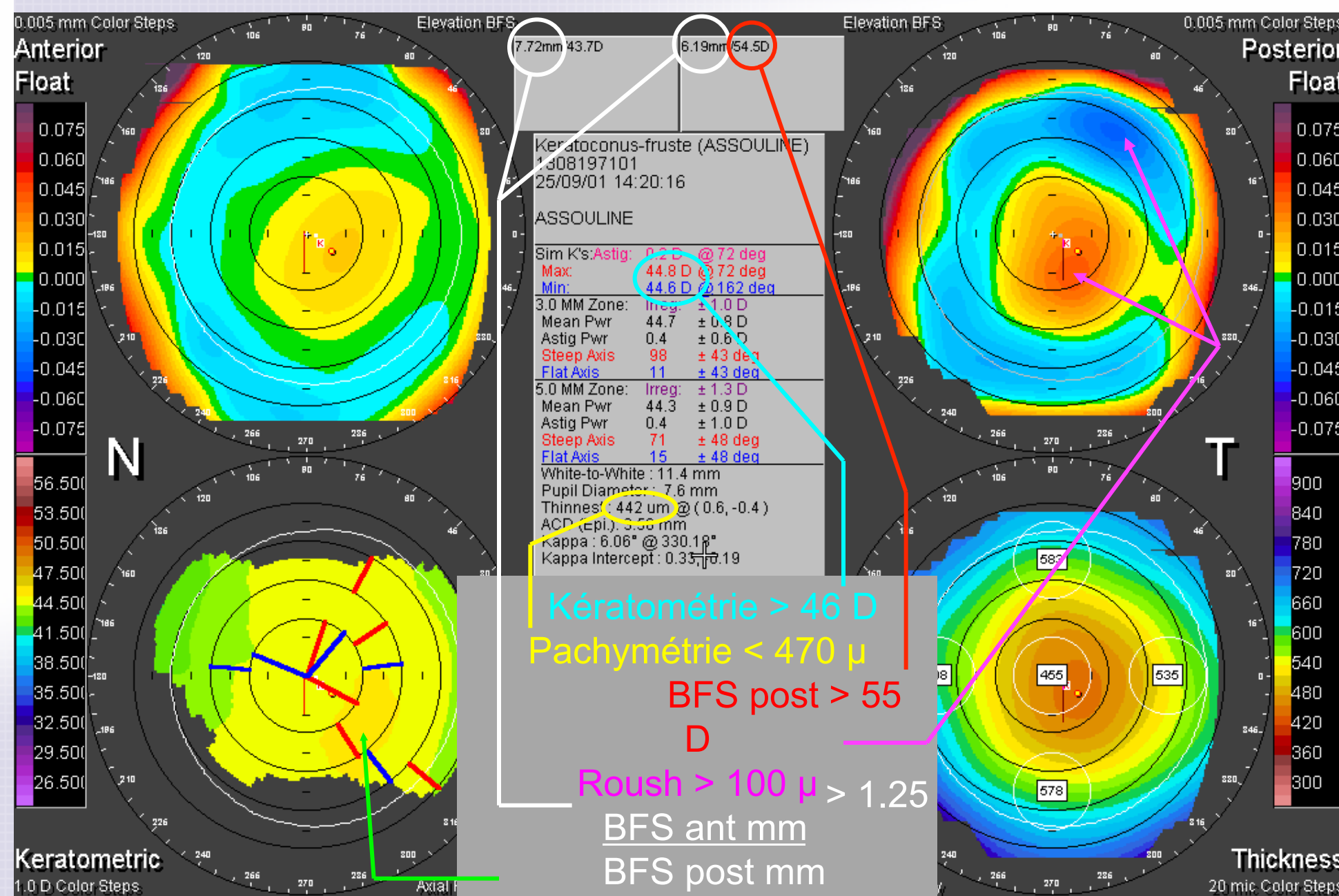
Absolute

- Lack of informed consent
- Keratoconus (Pellucid)
- Persistent warpage
- Herpes
- Collagen disease (active)
- Pachymetry / ablation depth
- Functional failure
- Infection, inflammation

Relative

- Flat cornea
- Recurrent erosion
- Exposure keratitis (lid surgery)
- Floppy eyelid
- Progressive ametropia
- Dryness (Oxford III)
- Hypoesthesia
- Blepharitis
- Vascularization
- Traumatic astigmatism
- Pterygium extension to flap area

2. Keratoconus Detection



DURING THE SURGERY

Intra-Operative Complications

- 3. Technical issues
- 4. Flap making trouble
- 5. Epithelial abrasion
- 6. Buttonhole
- 7. Decentered ablation
- 8. Central Islands

Lasik Complications

Intra-Operative

3. Technology Issues

- Equipement not OK / Cannot be used : **Failure**
= **Maintenance** issue
- Equipement OK / Non adequate use : **Fault**
= **Conception** or environnement may be improper
= **Training** of surgeon or personnels may deficient
= **Risk Taking** from non observation of rules
- Equipement OK / Unreliable use: **dysFunction**
= **CE Mark** issue (unreliable marketed device)
= **Materiovigilance** alert (Device outcome survey)
- Equipement OK / Adequate use: : **Fate ?**
= **Random**, non faulty complications

Lasik Complications

Intra-Operative

Excimer Laser Check list

Item	Problem	Solution
Gas source	Loss, Leak Abnormal flow Non adequate mix	Internal Generator, alarms Monitoring Lab test
Power source	Failure	UPS, "SAVE" function
Laser source	Quality factor Variable Fluence	Large cavity, ceramic head Fluencemeter, calibration
Delivery	Beam alignment Non homogneous beam Opto-mecanics diaphragm	Less optics, center test Multiprisme, nitrogen path, film test Fractal, gaussian, scanning, flying
Eye tracker	Initialisation Pupil contour	Intraoperative check HR-CCD, metal ring /artificial limbus
Computer	Saccads Buggs Re-booting Data entry	Response time < 10 msec Homologation Real-time save function
Microscope	Defocus, parallaxe Burnt bulbs Flap and interface	Logical locks / alarms, dual check Co-axial, anti-parallaxe mires Stocked bulbs ! Slit, polarizer

Lasik Complications

Intra-Operative

4. Flap Making Trouble

- **No (more)suction**
- **No cut**
- **Interrupted cut (half flap)**
- **Blade exit within optical zone (Scalp)**
- **Blade extension to hinge (Free Cap)**
- **Small / Thin / Decentered flap**
- **Large flap (Hemorrhage)**
- **Epithelial Abrasion**
- **Perforation (Button Hole)**
- **Near Perforation (Bowman island)**
- **Multi-layered stromal strands (recut)**
- **Dysjunction of flap segments (RK)**

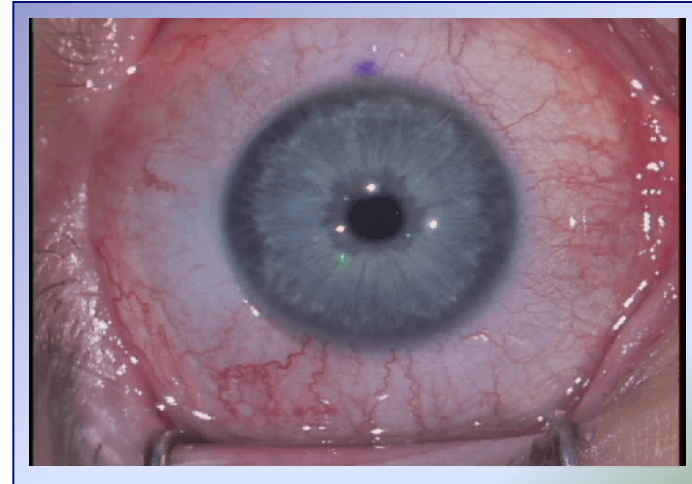
Lasik Complications

Flap Making Trouble

Introduction

Are mostly related to high level of compression required

- **Epithelial adhesion is abnormal**
 - Abrasion, DLK, invasion, melt
- **Extreme corneal shape**
 - < 510 μm or > 46 D
 - Buttonhole, ectasia
 - < 40 D or > 13.5 mm
 - Suction loss
 - Small / incomplete flap
 - Decentered or free cap
 - < 11.5 mm and > 46 D
 - Large flap with hemorrhage
 - Small hinge and displacement



Can be avoided

- By careful selection
- By zero compression head, XP keratomes
- by IntraLase WYSIWYG

Lasik Complications

Intra-Operative

5. Epithelial Abrasion

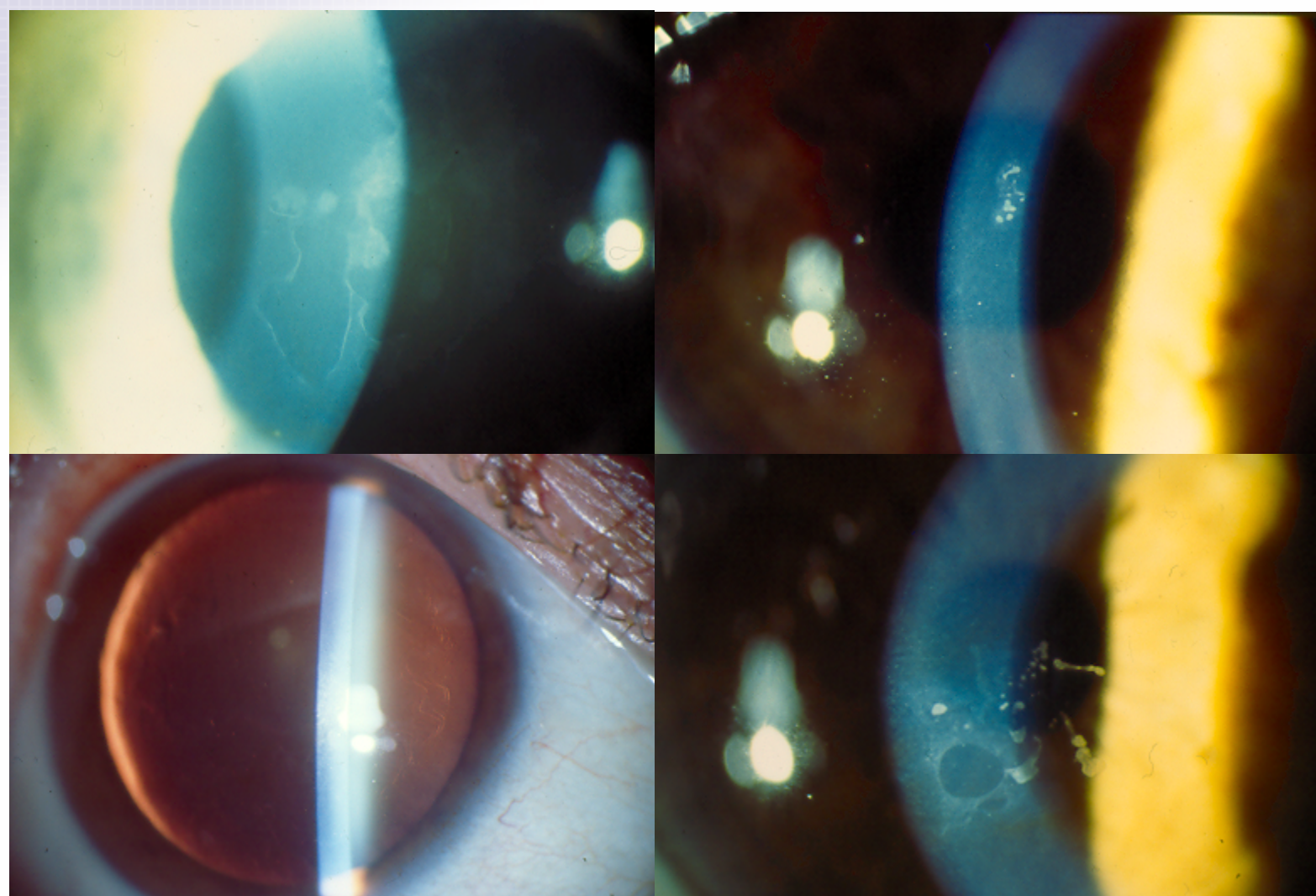
- Risk factor
 - Age >50, Diabetes, REE, RGP, Ink, Poor irrigation
 - Pach > 570, E =180, K <41, anesthesia > 5 min.
- Consequences
 1. **Folds** => fibrosis at epithelium / stroma interface
 2. Diffuse Lamellar keratitis (**SOS**)
 3. **Epithelial invasion**
 4. **Flap melt**
- Prevention
 - Re-polish **microkératome** or « zero compression » head
 - Beware of **Celluvisc**
- Management
 - **Save, Spread, Smooth and Protect** by N&D lens for 48h

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Intra-Operative

Epithelial Abrasion

Recognizing Map-Dot-Fingerprint Dystrophy (M Assouline)

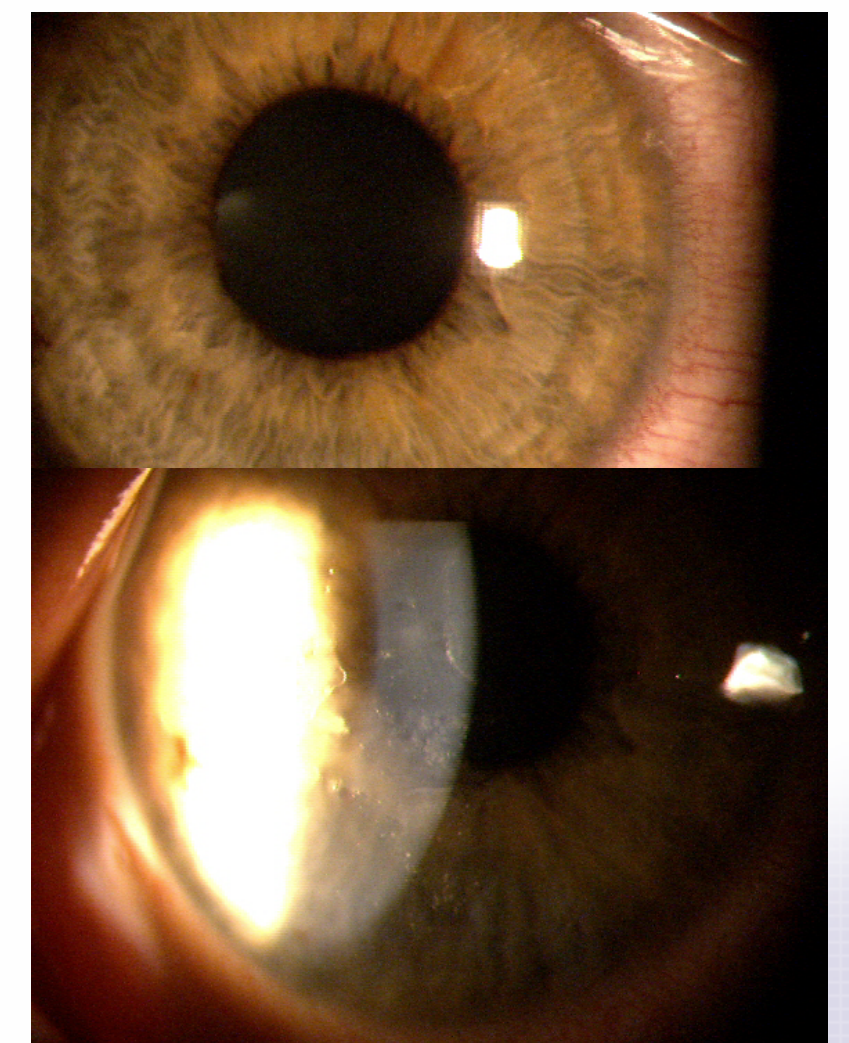


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Intra-Operative

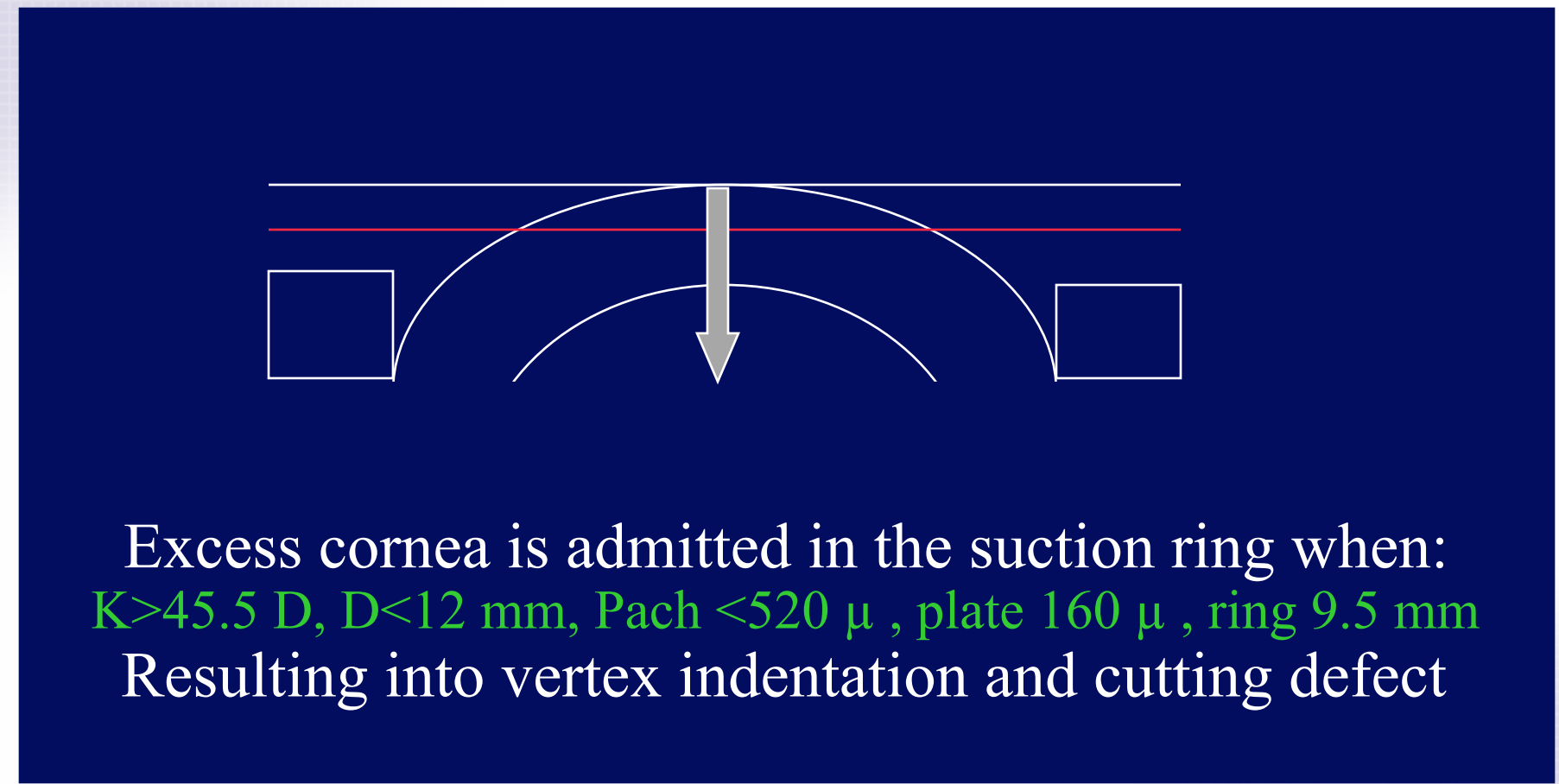
6. Button Holes

- Causes
 - Steep cornea (>46 D)
 - Toric cornea (> 3 D)
 - Defective blade
 - Inadequate suction (setting, tubing, occluded ring)
 - Pseudosuction (conjunctiva, irregular sclera)
 - Flat cornea (<41) : less protrusion of cornea tissue ?
- Prevention
 - **Thicker flap and smaller ring** for extreme K and Cyl
 - **Hinge on steep meridian**
 - Avoid cheap unknown blades
- Management
 - Should not lift...
 - **Do not ablate !!!**
 - **Recut @ 3 months**

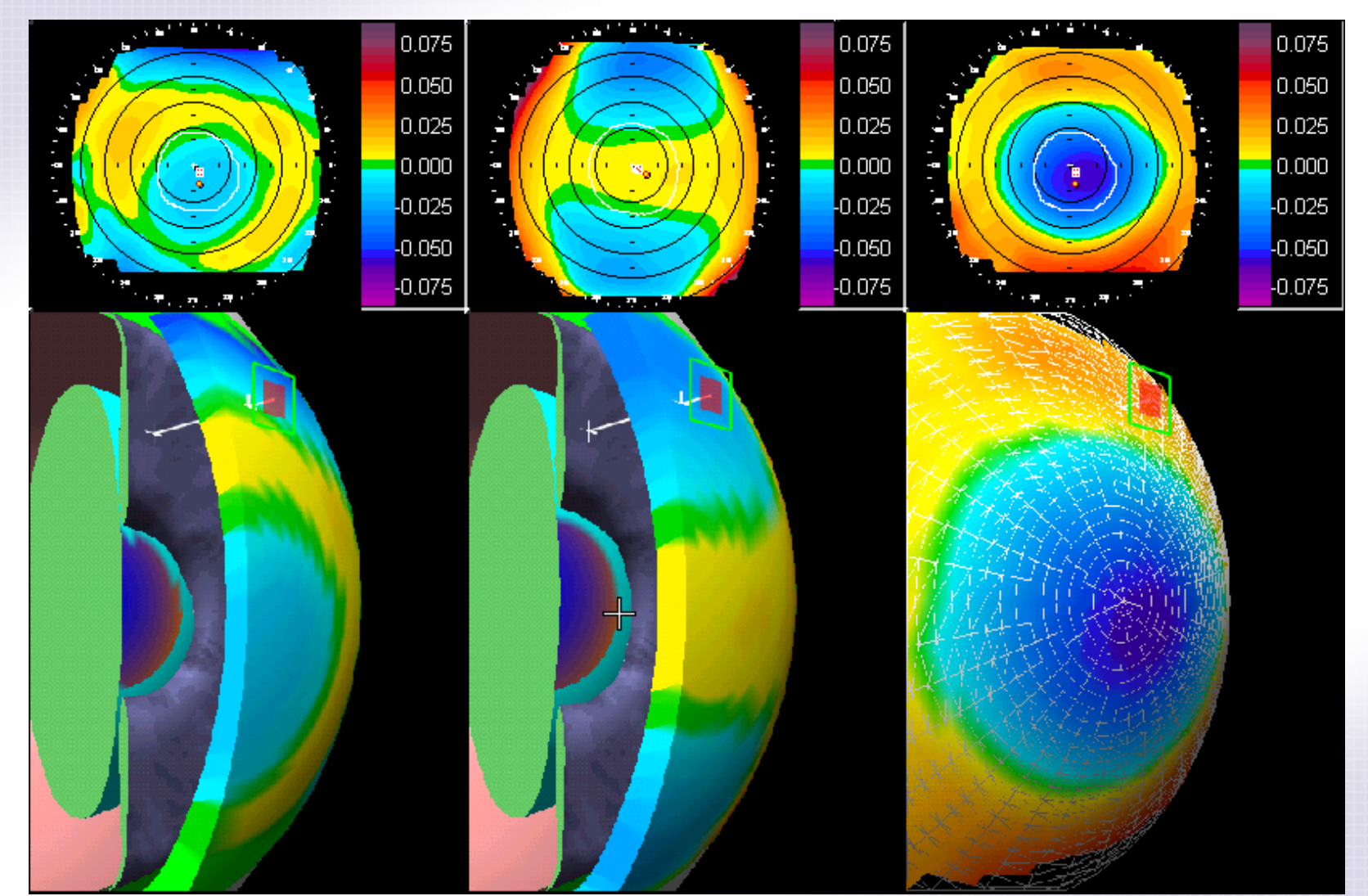


Lasik Complications

Button Holes Pathogenesis

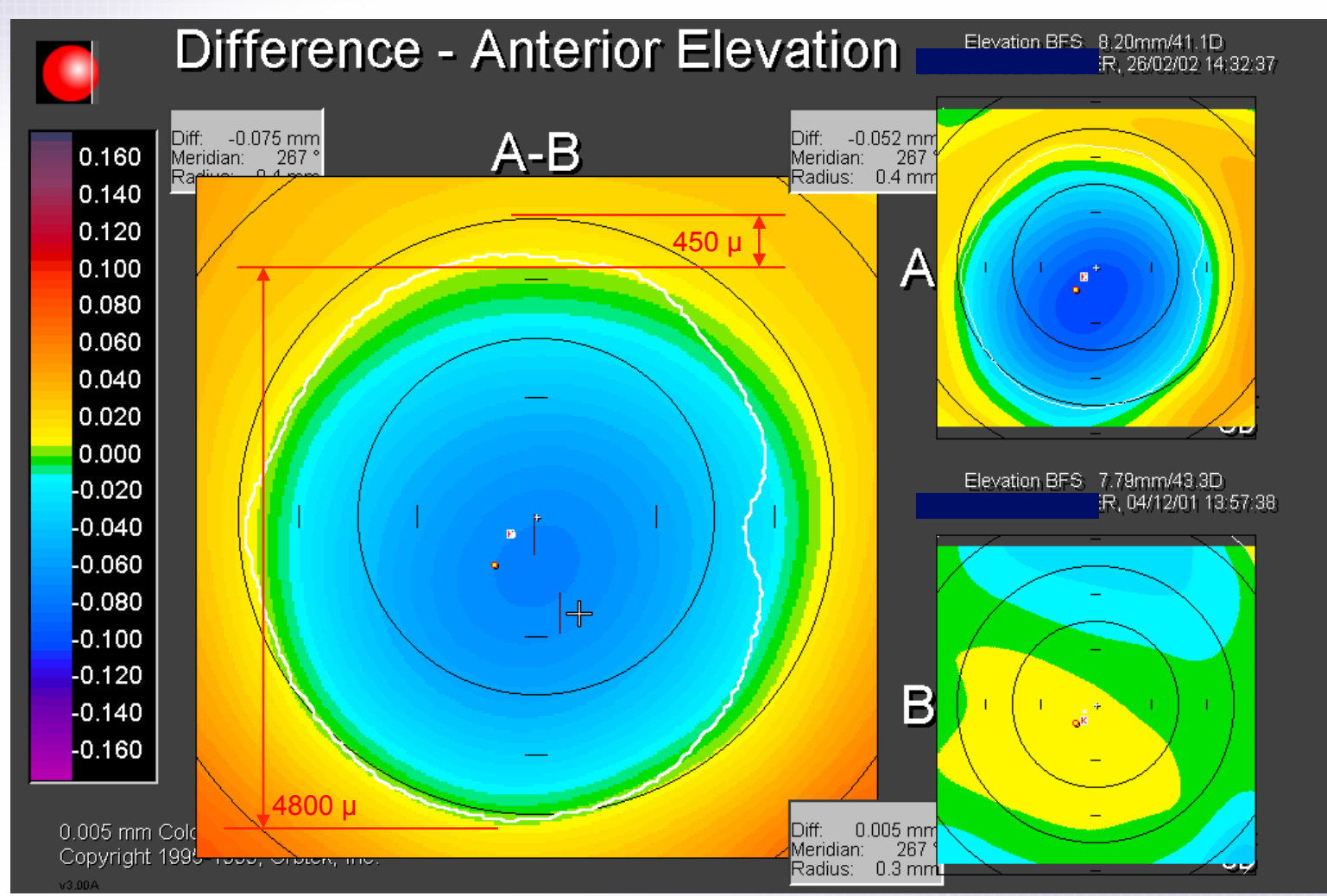


7. Decentered Ablation (M Assouline)



Decentration and Optical Zone Size (M Assouline)

-10.50 D
 POZ 5.00
 AOZ 4.80
 Decentered
 225μ 270°
 (70 colors)



AFTER THE SURGERY PostOperative Complications Optical Outcome

- 9. Under / Over Correction (M Assouline)
- 10. Regression (M Assouline)
- 11. More flap trouble (N Trap)
- 12. Quality of Vision (J Tan)

9. Under / Over Correction

- Primary and Immediate (7 to 30 days postop.)
- Common causes:
 - Data entry (chart versus laser record)
 - Laser reliability (fluence)
 - Software / hardware changes
 - Surgeons' consistency (nomogram)
 - Refraction standards
 - Wet vs Dry ablation, flap uptime
- Management
 - Short term enhancement (small diameter)
- Prevention
 - Chart keeping / outcome analysis

Under / Over Correction Data Handling Safety / Nomogram Building (M Assouline)

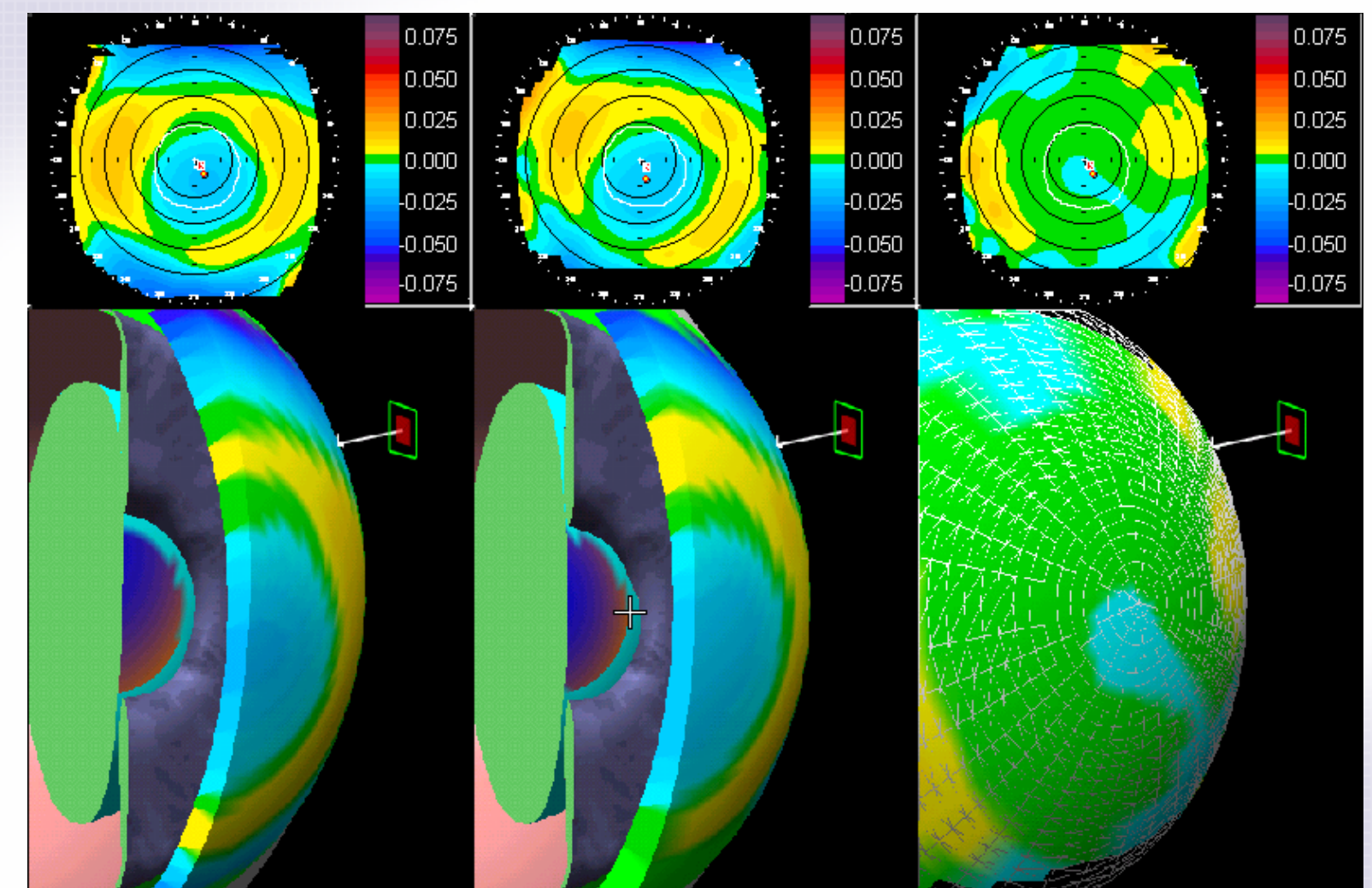
	Sph-OD	Cyl-OD (-)	Ax-OD	Sph-OS	Cyl-OS (-)	Ax-OS
Prescription	-2.75	-1.50	170°	-3.25	-1.25	10°
Manifest	-3.00	-1.50	170°	-3.25	-1.25	10°
Objective	-2.50	-1.50	170°	-3.25	-1.25	10°
PPR *	-2.66	-1.72	167°	-3.12	-1.34	12°
Intended	-2.75	-1.50	170°	-3.25	-1.25	10°
Residual	0.00	0.00		-1.25	0.00	
Data entry **	-3.00	-1.75	170°	-2.25	-1.50	10°
One Month	+0.25	-0.40	85°	-1.50	-0.25	90°
Six Months	0.00	-0.25	0°	-1.75	0.00	0°
Deviation	0.00	-0.25	0°	-0.50	0.00	0°

* Intended after refraction from aberrometry
** Intended after refraction from manifest refraction corrected

10. Regression

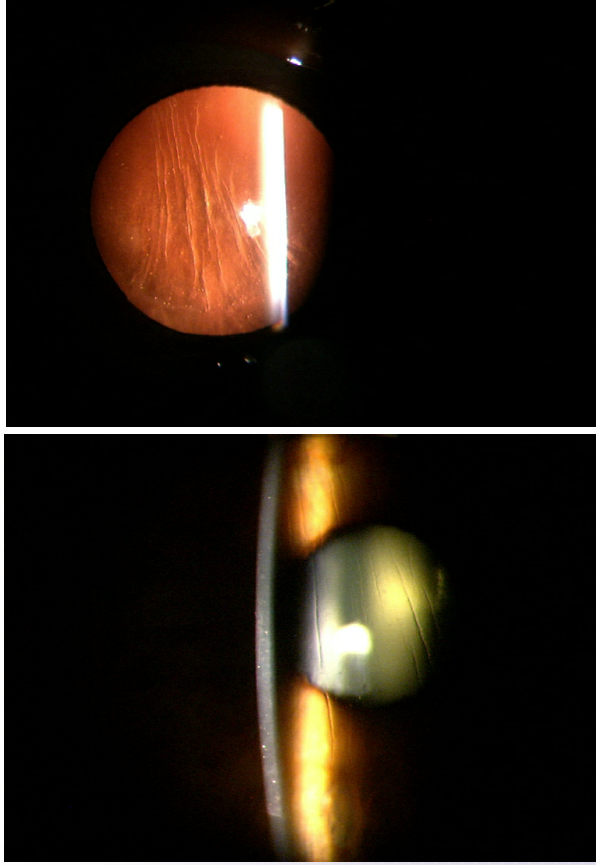
- Secondary and delayed (30 days to 2 years)
- Common causes
 - Refraction not stable
 - Epithelial hyperplasia (small transition zone)
 - Corneal ectasia (thin corneas)
- Management
 - Relift rather than recut
 - Delay enhancement **1 month per diopter**
 - Rule out ectasia with elevation topography (clear interface)
 - < 50µm forward movement of the posterior surface
 - < 100µm elevation difference
- Prevention
 - Limit Indications (-8 D to +4 D)
 - Enlarge transition zones

Regression Anterior (Hyperplasia)

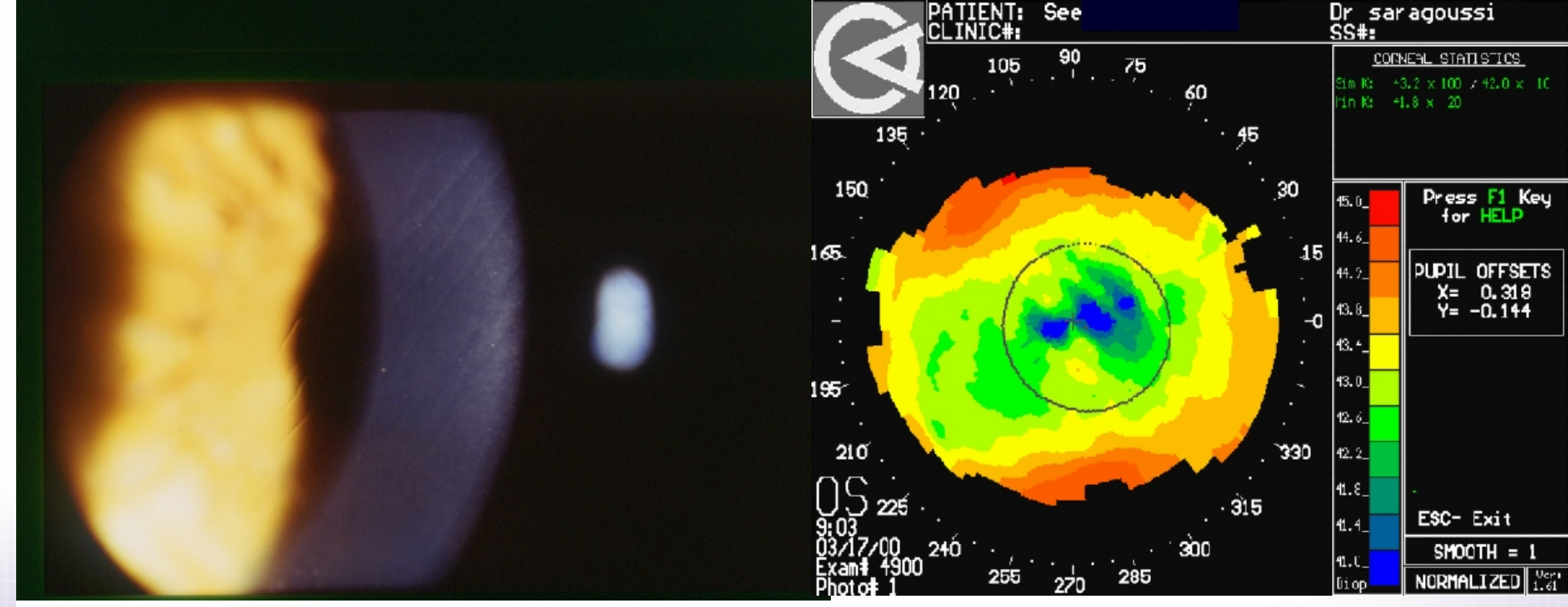


12. More Flap Trouble

- **Epithelium loose with folds**
 - Abrasion (smooth it and put a N&D lens)
- **Hinge shoulder**
 - Ablation of hinge (protection)
- **Folds from hinge**
 - Flap displacement (lift and realign)
- **Deep striae**
 - Tenting effect (benign)
- **Bowman striae**
 - Fibrosis / epithelial abrasion
 - Lift and stretch + PTK + epithelium removal



Flap Folds from the Hinge (JJ Saragoussi)



Early Flap Folds Management (J Vryghem)

