AAO Anaheim 2003

Course 584 Nov18th, 2-415PM

LASIK following previous eye Surgery

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Review of the scientific literature

- Published reports on lasik after other surgical procedures are limited
- Lasik is still in its infancy and large series of patients who have undergone other surgical procedures are lacking
- As more surgeons perform lasik, more data will be reported on eyes that have had other surgical procedures prior to lasik

Lasik after Penetrating Keratoplasty

Eventhough the success rates of PKP are high certain conditions still limit quality of vision. These include:

- High ammetropia
- High astigmatism/Irregular astigmatism
- Anisometropia
- Spectacle intolerance
- CL intolerance

Lasik after PKP
Review of the Literature

- 10 published reports
- Number of eyes reported ranged from 4 to 26
- Mean time interval between PKP and Lasik ranged from 12 mos to 23 years
- 90/119 eyes reported had keratoconus as the diagnosis prior to PKP
- Mean age 38.6 years (19-80 years)

Lasik after PKP
Review of the Literature

- Mean time interval between final suture removal and Lasik – only one published study reports this information:

  Donnenfeld et al: 35.3 months

  Minimum time interval between final suture removal and Lasik ranged from 3-10 months

Lasik after PKP

- Microkeratomes used: 5 studies report using the ACS; 1 study Moria LSK and 1 study did not state which keratome was used.
- Spacer plates used: both 160 micron and 180 micron plates were used

Lasik after PKP
Review of the Literature

- Lasers used:

Nidek:	1
VISX 20/20:	2
Summit Apex Plus:	1
Meditec:	1
Technolas 116:	1

One study did not state model excimer used

Lasik After PKP
Published Results

110 eyes reported in 8 publications

- Range of Follow Up Periods: 6-12 months
- Mean Myopic Preop. Sph. Eq.: -8.47D
- Range of myopia treated was –2.25D to –15.25 D
- Mean Preop Cyl. in Myopic eyes: - 4.97D
- Range of Preop Cyl.treated : -2D to –15D

Lasik After PKP
Published Results

- Mean Post Op Sph. Eq.: est –0.67D
- Range of Post op Sph. Eq.: +1.25-5D
- Mean Post op Cyl.: -2.08D
- Range of Post op Cyl.: -0.25 to –7D

Lasik After PKP
Reduction in Myopia

- Lima (Can J. Ophth 2001) 91% reduction (23)
- Donnenfeld (Ophth 1999) 85.6% (23)
- Forseto (JCRS 1999) 85.3% (22)
- Webber (BJO 1999) 74.8% (18)
- Kwitko (JCRS 2001) 90% (9)
- Arenas (JRS 1997) 78% (4)
- Lam (JCRS 1998) 64.8% (2)
- Parisi (JCRS 1997) 100% (1)

Lasik After PKP
Reduction in Astigmatism

- Lima (Can J. Ophth 2001) 60% reduction (23)
- Donnenfeld (Ophth 1999) 45.6% (23)
- Forseto (JCRS 1999) 58.3% (22)
- Webber (BJO 1999) 65.8% (18)
- Kwitko (JCRS 2001) 47.4% (9)
- Lam (JCRS 1998) 66.3% (2)
- Parisi (JCRS 1997) 40% (1)

Reduction was in absolute # as vector analysis was not performed in all studies

Gain of >/=1 lines BCVA following Lasik After PKP

- Lima (Can J. Ophth 2001) 8 eyes (35%)
- Donnenfeld (Ophth 1999) 12 eyes (52%)
- Forseto (JCRS 1999) 9 eyes (41%)
- Webber (BJO 1999) 15 eyes (58%)
- Kwitko (JCRS 2001) 4 (44%)
- Lam (JCRS 1998) Not reported
- Parisi (JCRS 1997) 0 (0%)

Loss of >/=1 lines BCVA following Lasik After PKP

- Lima (Can J. Ophth 2001) 2 eyes (9%)
- Donnenfeld (Ophth 1999) 2 eyes (9%)
- Forseto (JCRS 1999) 2 eyes (9%)
- Webber (BJO 1999) 3 eyes (12%)
- Kwitko (JCRS 2001) 5 (36%)
- Lam (JCRS 1998) Not reported
- Parisi (JCRS 1997) 0 (0%)

Post op UCVA >/= 20/40

- Lima (Can J. Ophth 2001) 78%
- Donnenfeld (Ophth 1999) 36%*
- Forseto (JCRS 1999) 54.5%
- Webber (BJO 1999) 28%
- Kwitko (JCRS 2001) 33%
- Lam (JCRS 1998) 50%
- Parisi (JCRS 1997) Not reported

PKP Lasik After Hyperopia

- Range of Follow Up Periods: 6-12 months
- Mean Hyperopic Preop. Sph. Eq.: +4.74D
- Range of Hyperopia treated was +1.50D to +7.13 D
- Mean Preop Cyl. in Hyperopic eyes: - 4.16D
- Range of Preop Cyl.treated : -1.5D to –6D

Lasik After PKP --Hyperopia

- Mean Post Op Sph. Eq.: -0.73
- Range of Post op Sph. Eq.: -2.25 to +0.75
- Mean Post op Cyl.: -1.81D
- Range of Post op Cyl.: -0.5 to –5.50D

Lasik After PKP
Reduction in Hyperopia

- Lima (Can J. Ophth 2001) 77% (4)
- Kwitko (JCRS 2001) 79% (5)

Lasik After PKP
Reduction in Astigmatism

- Lima (Can J. Ophth 2001) 88% (4)
- Kwitko (JCRS 2001) 79% (5)

Regression and Retreatments

- Not reported in all studies: Kwitko reported retreatment rate of 42.9% because of cyl undercorrection
- Stabilization of the postop refraction appears to occur at one month (Lima, Forseto, Donnenfeld) with no significant change at 6 months
- Tendency for eyes to remain undercorrected

Lasik After PKP Complications

- Increased astigmatism postop: 5 cases
- Epithelial Ingrowth1,2
- Hemorrhage into the flap: 1 case
- Microkeratome Jam on suture: 1 case
- Buttonhole: 1 case
- Flap dislocation day: 1 case 1 day postop
- Decentered ablation:1 case
- RD: 1 case pseudophakic 2 years post lasik

Complications that were not seen

- Wound dehiscence at the graft host junction 0% incidence
- Striae
- Unstable refractions postoperatively
- Graft rejections
- Significant endothelial cell loss
- Overcorrection

Recommendations For Performing Lasik After PKP

- Perform in those pts who have significant anisometropia and/or astigmatism who are spectacle and/or CL intolerant
- Present realistic expectations to pts-you are attempting to reduce their ametropia to get them into spectacles
- Perform no sooner than 6 months after all sutures have been removed but the longer you wait the better
- Wait for refractive and topographic stability

Recommendations For Performing Lasik After PKP

- Center flap over the pupil
- Avoid the microkeratome incision at the graft-host junction-begin 1mm outside or inside the graft host junction
- Experience counts—the longer you keep suction on the eye the greater the chance of wound dehiscence
- Use steroids for a longer period of time (Sen JCRS 2002) at least two weeks

Further Data Required

- Position of Hinge and its effect on outcome
- Effect of creating the flap on refractive change
- Flap thickness
- Effect of newer generation lasers with smaller spot sizes and tracking capabilities
- Wavefront technology and topographically linked lasik should improve results

LASIK After Cataract Surgery

Author	Laser Used	Microkeratome Used	Mean Interval between Procedures
Ayala et. al. JRS 2001	NIDEK EC-5000	ACS	10 mos. (3 – 72 mos)

LASIK After Cataract Surgery

Author	Num. of Eyes	Mean Pre-Op Sph. Eq.	Mean Post-Op Sph. Eq.	Mean Pre-Op Astigmatism	Mean Post-Op Astigmatism
Ayala et. al. JRS 2001	22	-2.90 ± 1.8 D (-0.80 to -8.50D)	+0.40 ± 0.60 (-0.6 to +1.50D)	-1.70 ± 1.40D (-0.25 to -6.50D)	-1.80 ± 0.90*

* Not significant

LASIK After Cataract Surgery

Author	≥ 20/40	≥ 20/20
Ayala et. al. JRS 2001	45.4%	0%

BSCVA after LASIK was significantly better before LASIK at 3, 6 and 12 month periods.

LASIK After Cataract Surgery

Author	± 0.5D Emmetropia	± 1.0D Emmetropia
Ayala et. al. JRS 2001	50% (11)	81.8% (18)

LASIK After Thermal Keratoplasty

Author	Laser Used	Microkeratome Used	LTK Unit	Interval between Procedures
Portellinha et. al. JRS 1999	NIDEK	ACS 160/8.5	Fyodorov	>2 yrs.
Attia et. al. JRS 2000	B&L Tech 217	ACS 160/8.5	Sunrise	18 mos.

LASIK After Thermal Keratoplasty

Author	Num of Eyes	Mean Pre-Op Sph. Eq.	Mean Post-Op Sph. Eq.	Pre-Op Astigmatism	Post-Op Astigmatism	F/U
Portellinha et. al. JRS 1999	12	+3.31 (+1 to +6.50)	+0.88D (0 to +1.50D)	-0.48D (0 to –2.0D)	-0.38D (0 to –1.5D)	1 yr.
Attia et. al. JRS 2000	50	+2.92 (+0.50 to +6.50)	+0.36 (-2.75 to +3.75)			6 mos.

LASIK After Thermal Keratoplasty

Author	≥ 20/40	≥ 20/25	Loss of BCVA	Gain of BCVA
Portellinha et. al. JRS 1999	91%	66%	25% lost 1 line	8% gained 1 line
Attia et. al. JRS 2000	72%	46%	14% lost 1 line 16% lost 2 lines	34% gained 1 line

LASIK After Thermal Keratoplasty

Author	± 0.5D	± 1.0D
Portellinha et.al. JRS 1999	42%	67%
Attia et. al. JRS 2000	42%	60%

- No complications including no morphological changes on radial thermal scars.
- At 24 months, undercorrection 33% (+1.25 to +1.50D).
- At 6 months, 26% had regression.

Indications

- Penetrating keratoplasy
- Pseudophakia
- Glaucoma Sx
- Radial / Astigmatic keratotomy
- Retinal Surgery
- PRK/ Lasik
- Bioptics

LASIK Following Radial Keratotomy

- **Special Concerns**
- Treat epithelial inclusions and wound gapes prior to LASIK (re-suture if ness.)
- Careful surface marking
- Carefully handle flap to avoid tearing RK along incisions
- Thicker flaps
- Enhancements difficult
- Higher incidence of DLK?

LASIK following Radial Keratotomy

- PERK Study: 43% of eyes had a 1D hyperopic shift at 10 years
- Following LASIK 91% improvement or no change in BCVA[1]
- Following LASIK no loss of 2 lines in BCVA[2]
-

[1]Attia. Journal of Cataract and Refractive Surgery, 2001
[2]Lindstrom. Ophthalmology, 2000

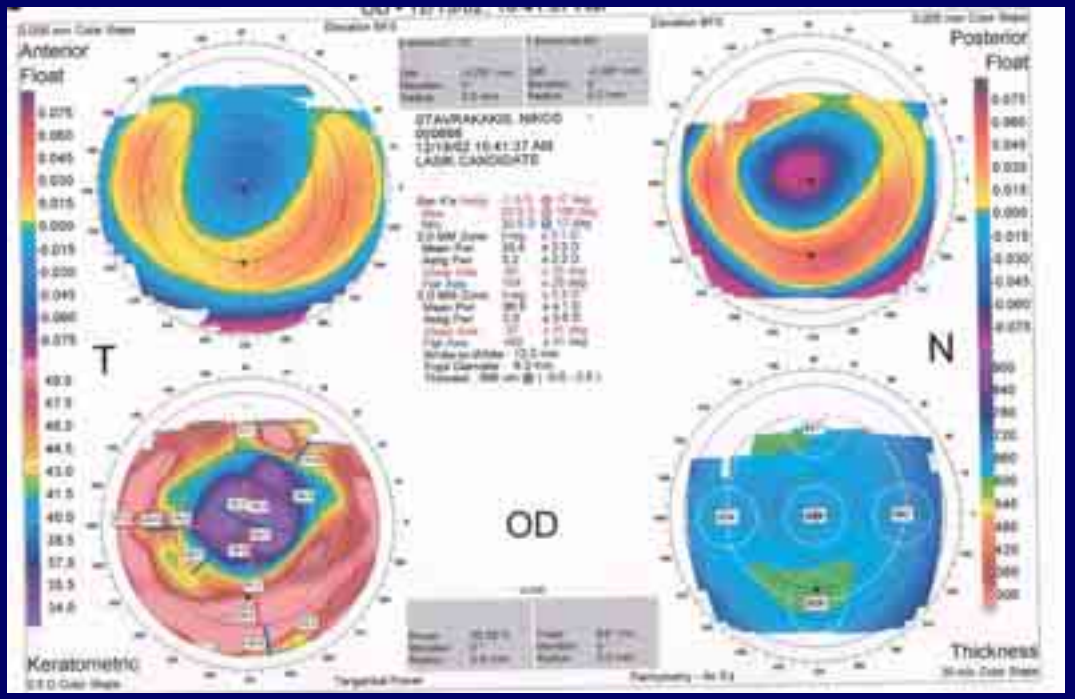
LASIK following Radial Keratotomy

- Hyperopic shift/ Visual fluctuation may continue
- Ineffective for irregular astigmatism (except with wavefront-guided and/or topo-guided)

50 y/o male, s/p RK for about –8 in USSR 1990

- UCVA 20/40-, 20/40
- +2.00 -2.50 117 20/25 (8/10)
- +2.75-2.25 070 20/25- (7/10)
- Significant night glare (dec)

Pre-op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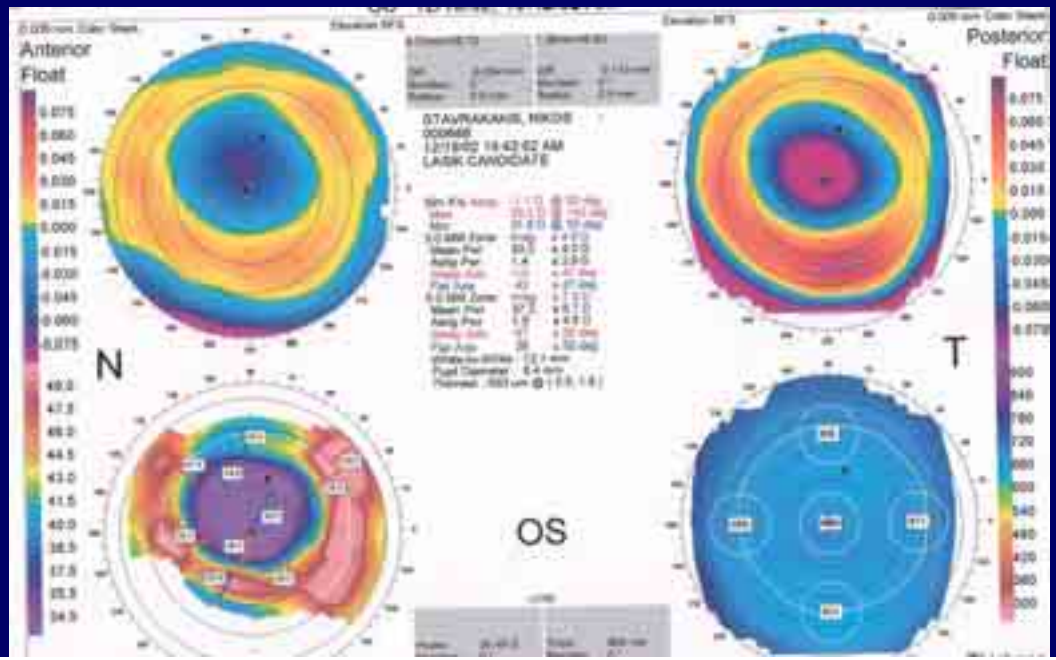
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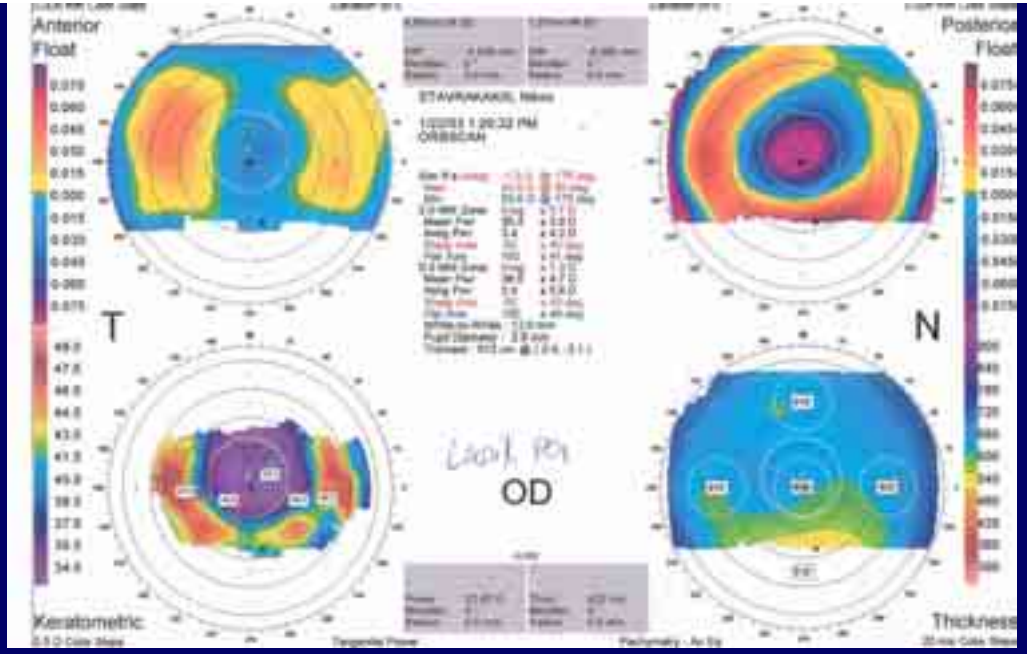
Post-op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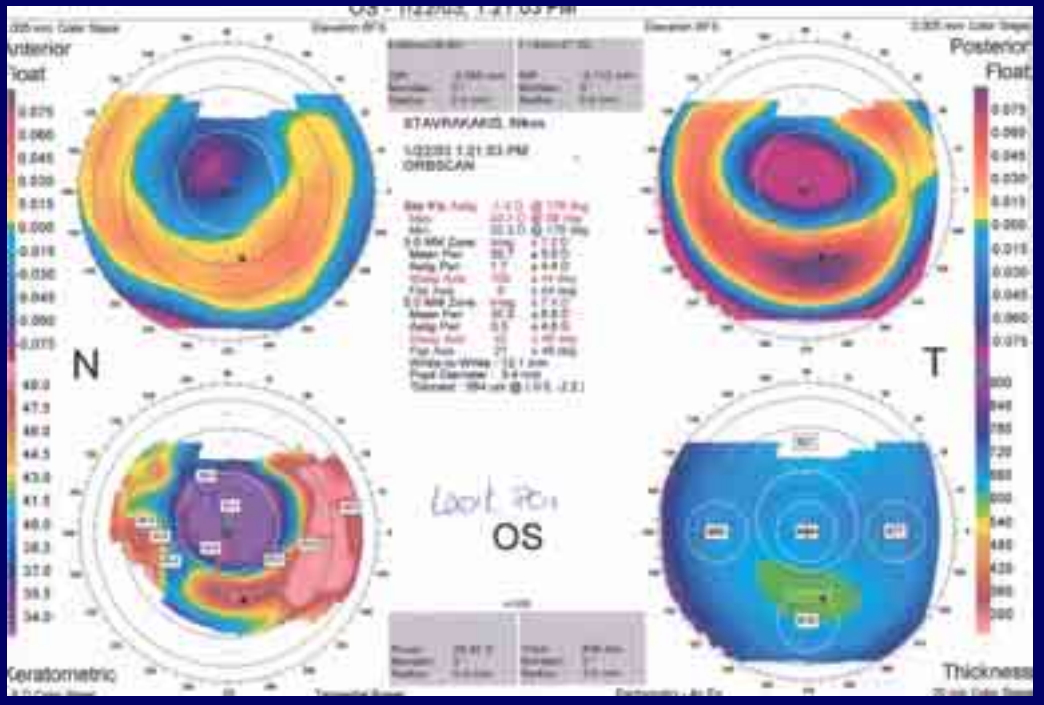
Thickness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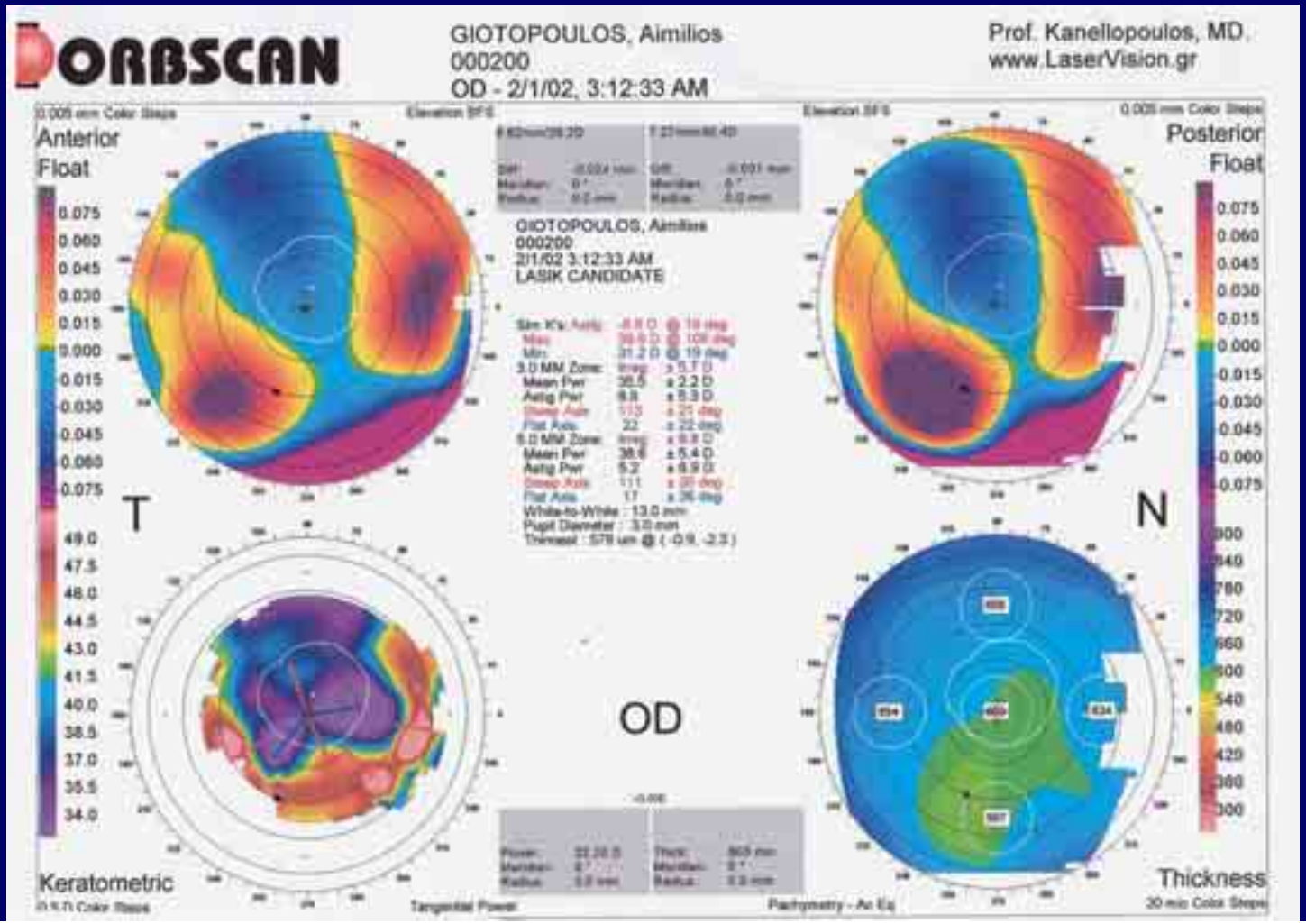
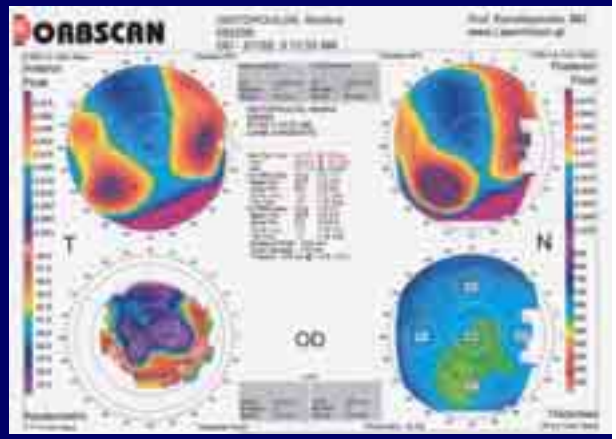
Thickness

46 y/o male 10 years s/p RK for –3.00 –1.50 x ? and subsequent hyperopic shift



46 y/o male 10 years s/p RK for –3.00 –1.50 x ? and subsequent hyperopic shift



sc: 20/80 diplopia

Rx +4.75 –6.00 x 17 gives 20/25

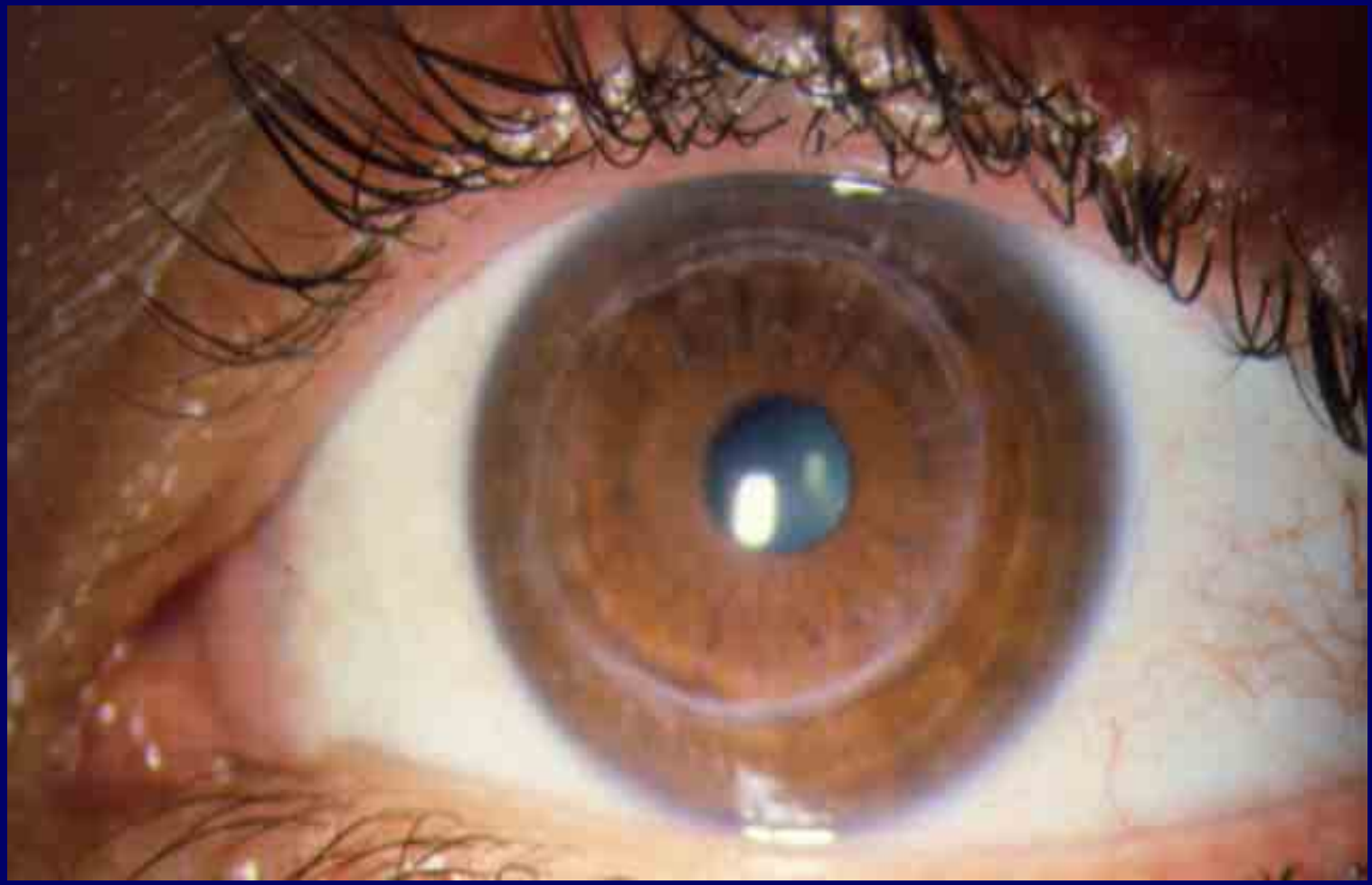
LASIK with the Moria M2 and the Allegretto-wave

- Post-op 3 months:
- **Sc 20/30!**
- +1.25 – 1.50 x 40 20/25

LASIK Following Penetrating Keratoplasty

- 39-70% of PK's are within 3D of emmetropia
- Mean cylinder following PK is 4-5 D
- Following LASIK 100% are within 3 D emmetropia[1]
- 91% of eyes BCVA remained the same or improved[1]
- Contact lens remains standard of care

[1]Donnenfeld. *Ophthalmology*, 1999



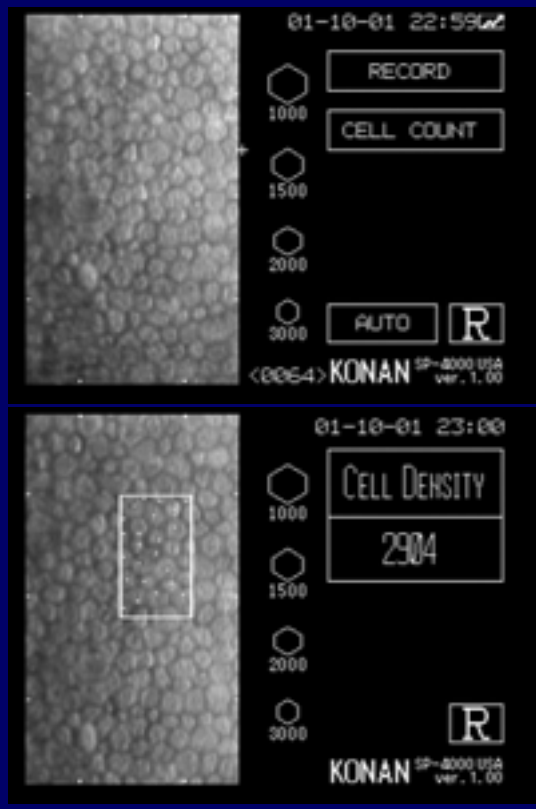
LASIK Following Penetrating Keratoplasty

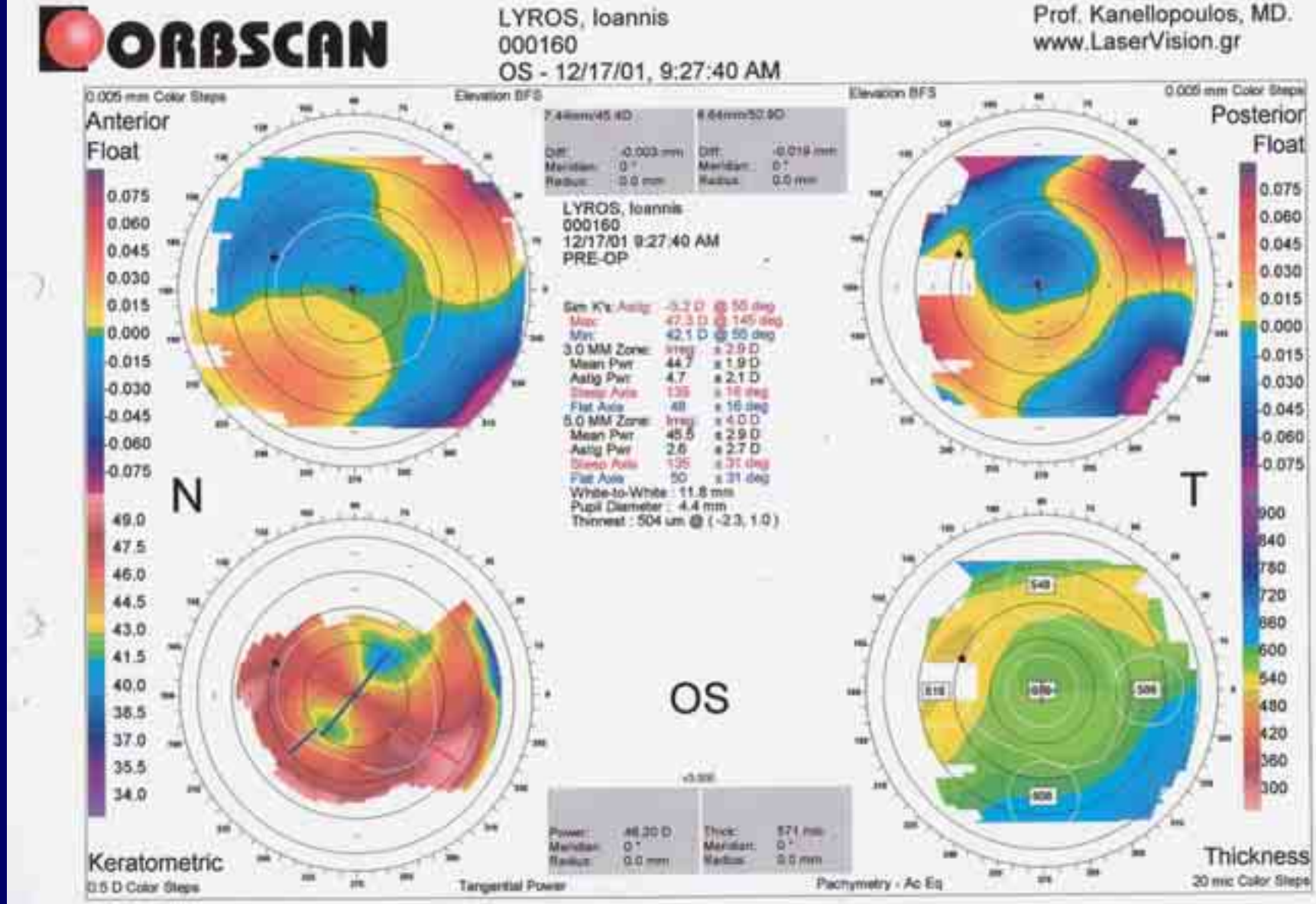
- **Special Concerns**
  - Avoid graft-host interface
  - Flap adherence 5 minutes
  - Increased postoperative corticosteriods
  - Endothelial dysfunction and flap slippage[1]
  - Keratoconus and progressive ectasia

[1]Donnenfeld. ASCRS, 2001

34 y/o male 2 years s/p Therapeutic PK for a CL-related ulcer

- Good cell counts: top= OD unaffected eye
- Bottom= OS eye with PK
- Rx –4.50 –5.50 x 56 with the Allegretto-wave
- Post-op 3 months:
- **Sc 20/30!**
- +0.25 – 0.50 x 50 20/25

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LYROS, Ioannis
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Prof. Kanellopoulos, MD.
www.LaserVision.gr
0.005 mm Color Steps
Elevation BFS
Anterior
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0.075
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PRE-OP
Sim K's: Astig -3.2 D @ 55 deg
Max: 47.3 D @ 145 deg
Min: 42.1 D @ 55 deg
3.0 MM Zone: Irreg ± 2.9 D
Mean Pwr 44.7 ± 1.9 D
Astig Pwr 4.7 ± 2.1 D
Steep Axis 139 ± 16 deg
Flat Axis 49 ± 16 deg
5.0 MM Zone: Irreg ± 4.0 D
Mean Pwr 45.5 ± 2.9 D
Astig Pwr 2.6 ± 2.7 D
Steep Axis 135 ± 31 deg
Flat Axis 50 ± 31 deg
White-to-White : 11.8 mm
Pupil Diameter : 4.4 mm
Thinnest : 504 um @ (-2.3, 1.0)
N
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OS
49.0
47.5
46.0
44.5
43.0
41.5
40.0
38.5
37.0
35.5
34.0
Keratometric
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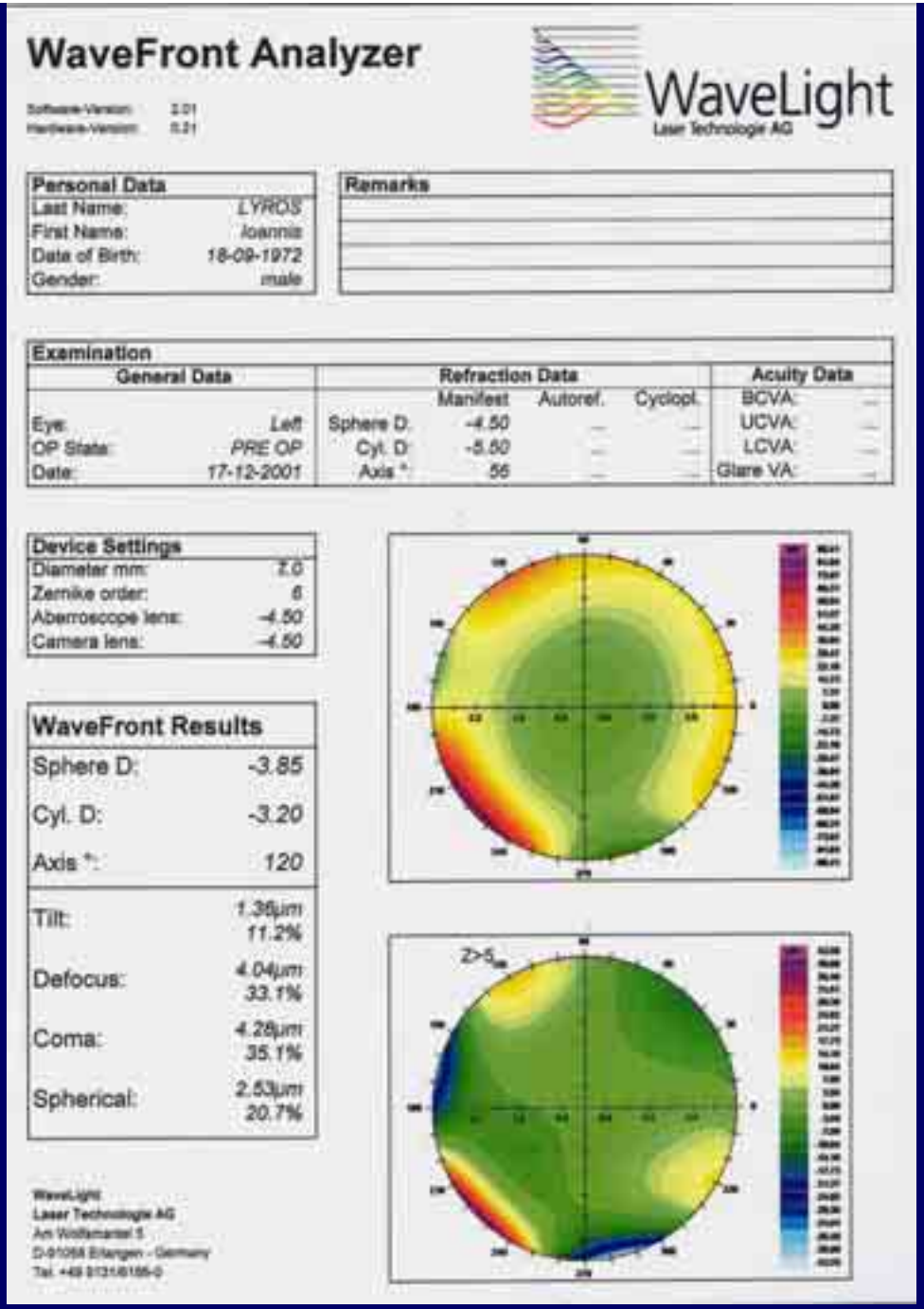
Wavefront

- Regular pattern
- Refraction differs with larger apeture



WaveFront Analyzer

WaveLight
Laser Technologie AG

Personal Data	
Last Name:	LYROS
First Name:	Ioannis
Date of Birth:	18-09-1972
Gender:	male

Remarks

Examination

General Data		Refraction Data	Manifest	Autoref.	Cyclopl.	Acuity Data	
Eye:	Left	Sphere D:	-4.50	...	...	BCVA:	...
OP State:	PRE OP	Cyl. D:	-5.50	...	...	UCVA:	...
Date:	17-12-2001	Axis °:	56	...	...	LCVA:	...
						Glare VA:	...

Device Settings	
Diameter mm:	5.0
Zernike order:	6
Aberroscope lens:	-4.50
Camera lens:	-4.50

WaveFront Results		
Sphere D:	-3.85	
Cyl. D:	-3.20	
Axis °:	120	
Tilt:	1.36µm	11.2%
Defocus:	4.04µm	33.1%
Coma:	4.28µm	35.1%
Spherical:	2.53µm	20.7%

WaveLight
Laser Technologie AG
Am Wolfsmantel 5
D-91058 Erlangen - Germany
Tel. +49 9131/6186-0

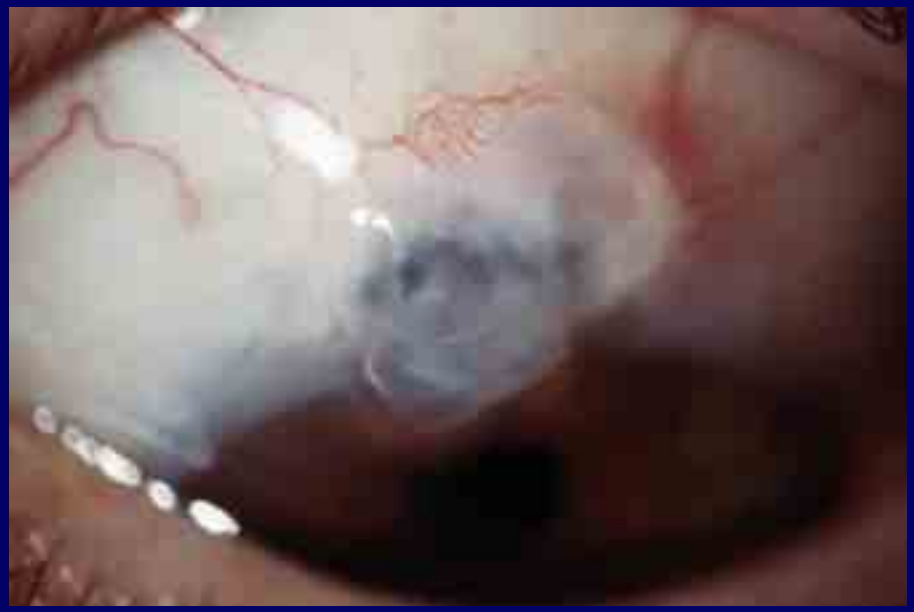
LASIK Following Cataract Surgery

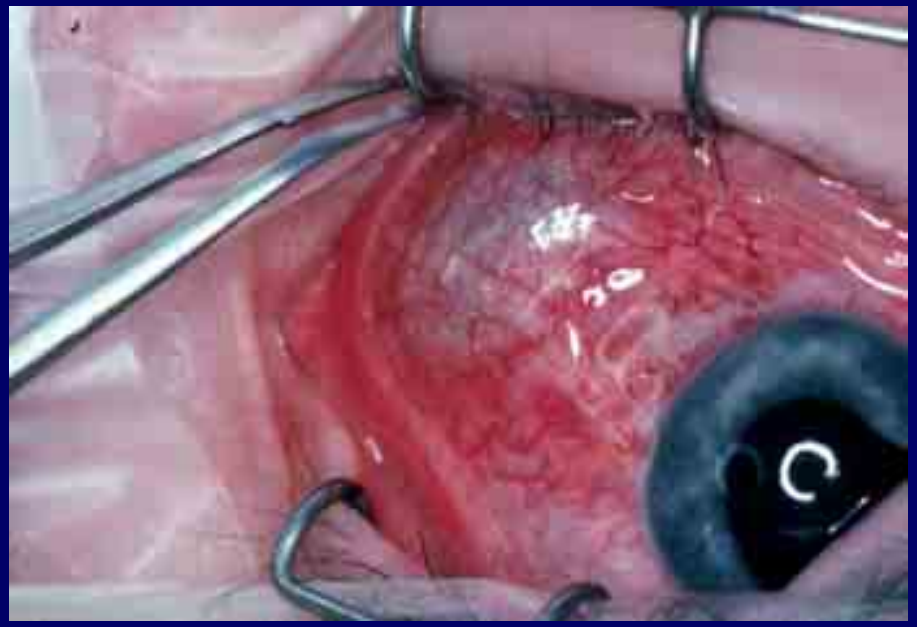
- No significant concerns with PC/IOL
- Careful with endothelial dysfunction around phaco wound site (flap slippage, poor adhesion)
  - ? PRK with AC/IOL
  - Future of cataract surgery

LASIK and the Glaucoma Patient

Absolute Contraindications

- Filtering/Valve Surgery
  -End stage disease
- Significant ON damage and/or Visual Field Loss
- Uncontrolled Glaucoma
- More than 2 Medications





LASIK and the Glaucoma Patient

- **Special Concerns**
  - Epithelial Sloughing:
    Discontinue topical meds pre-op
    Oral CAIs
  - Nerve Fiber Layer Analysis(HRT, GDx)
  - Post-operative IOP Measurement
    Mean Decrease in IOP is 4.3 mm Hg[1]
- **Beware of low IOP and progressive ON damage (interface fluid-Maloney Ophathalmology2002)**

- **[1]Danasoury. Journal ofRefractive Surgery, 2001**

LASIK Following Retinal Detachment

- Pre-LASIK vitreoretinal consultation
- Avoid LASIK in high buckles-risk of poor suction/ irregular flap
- Treatment of asymptomatic holes controversial
- Avoid silicone oil eyes

LASIK after Previous PRK

- Central keratometry/ Orbscan
- Consider Epithelial hyperplasia – (If suspected plan for thicker flap)
  - Increased postoperative steroids

LASIK after Previous LASIK

- Relift flap if possible (unless limited by thin cornea)
- Undercorrect consecutive ametropia[1]
-

[1]**Jacobs.** ***Journal of cataract and refractive surgery, 2001***

LASIK after Previous LASIK

- New flap should be larger and deeper than the original flap or narrower and thinner (the same MK will cut a thinner consecutive flap on a thinner cornea)
- Posterior flap ablation when residual stromal bed not adequate (not possible with flying-spot excimers)
- Personal preference: minimum cornea thickness> 400nm
- **35<K's<49**

BIOPTICS: Artisan phakic IOL and staged LASIK

A. John Kanellopoulos, MD

Manhattan Eye, Ear and Throat Hospital

ASCRS 1999

Background

- Unable to correct high myopes > 12-14D with LASIK
- Growing interest in phakic IOL's
- Anterior chamber (haptics, iris fixated)
- Posterior chamber

Methods

- Evaluated 12 patients with myopia > 10 D
- Initial flap formation
- 2-5 days later Artisan implantation
- 6 weeks later LASIK enhancement for RE > 0.50 D
- Follow-up 1D, 1Week, 1 month, 3Months, 6 Months

Results

- 12 eyes mean RE: -14.55D
- At 6 weeks mean RE: -2.50D
- 10 eyes received enhancement
- Postoperative RE: -0.45

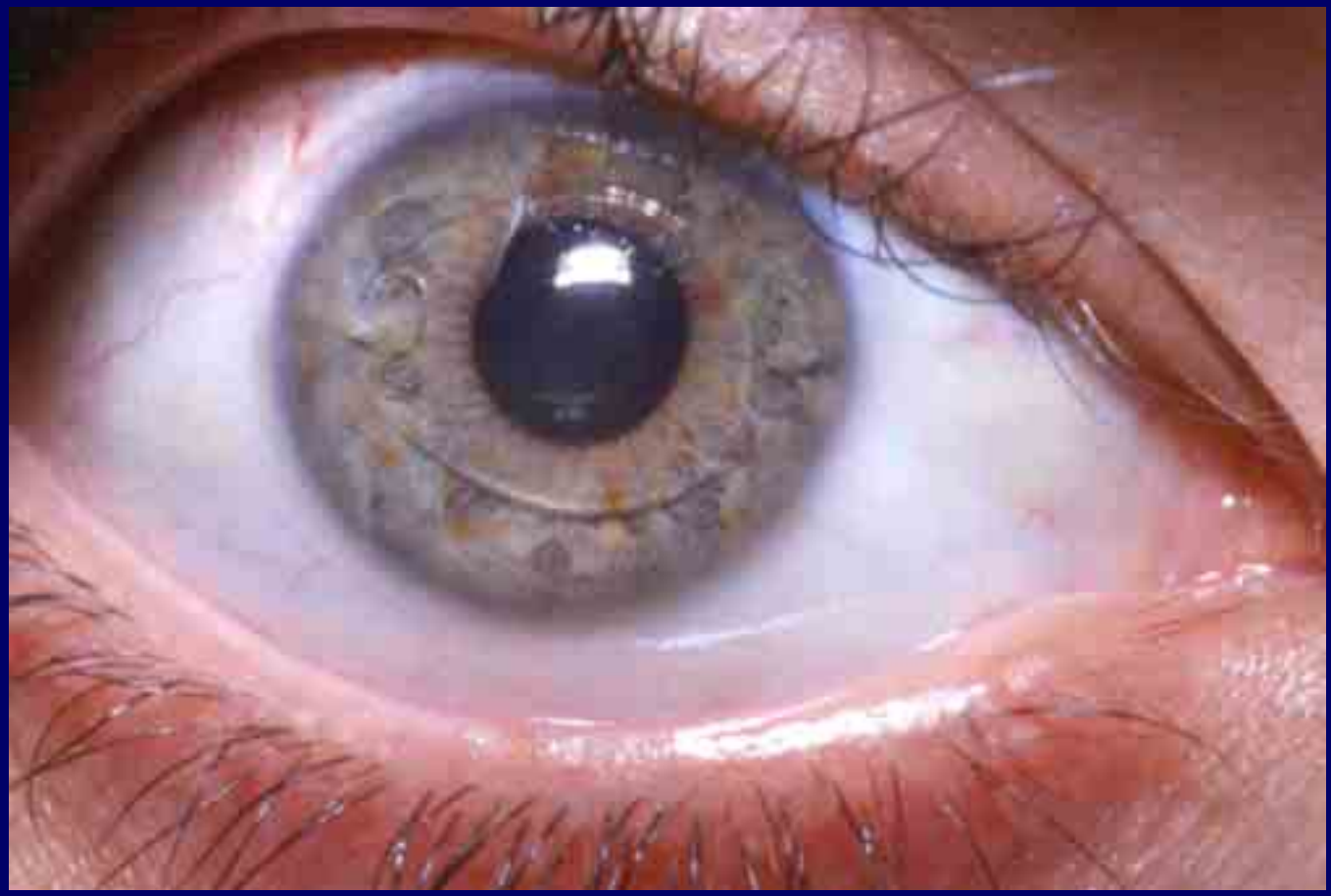
Results Va

	BCVA	UCVA
Preop	20/45	CF
Postop	20/27	20/42

Complications

	IOP spikes	ECC loss	Under Crctn > 0.50	Epi ingrowth	Glare Halos
Artisan	0	+2 %!	10	0	2
Enhancement	0	+1.2%!	0	1(Ns)	2

Artisan

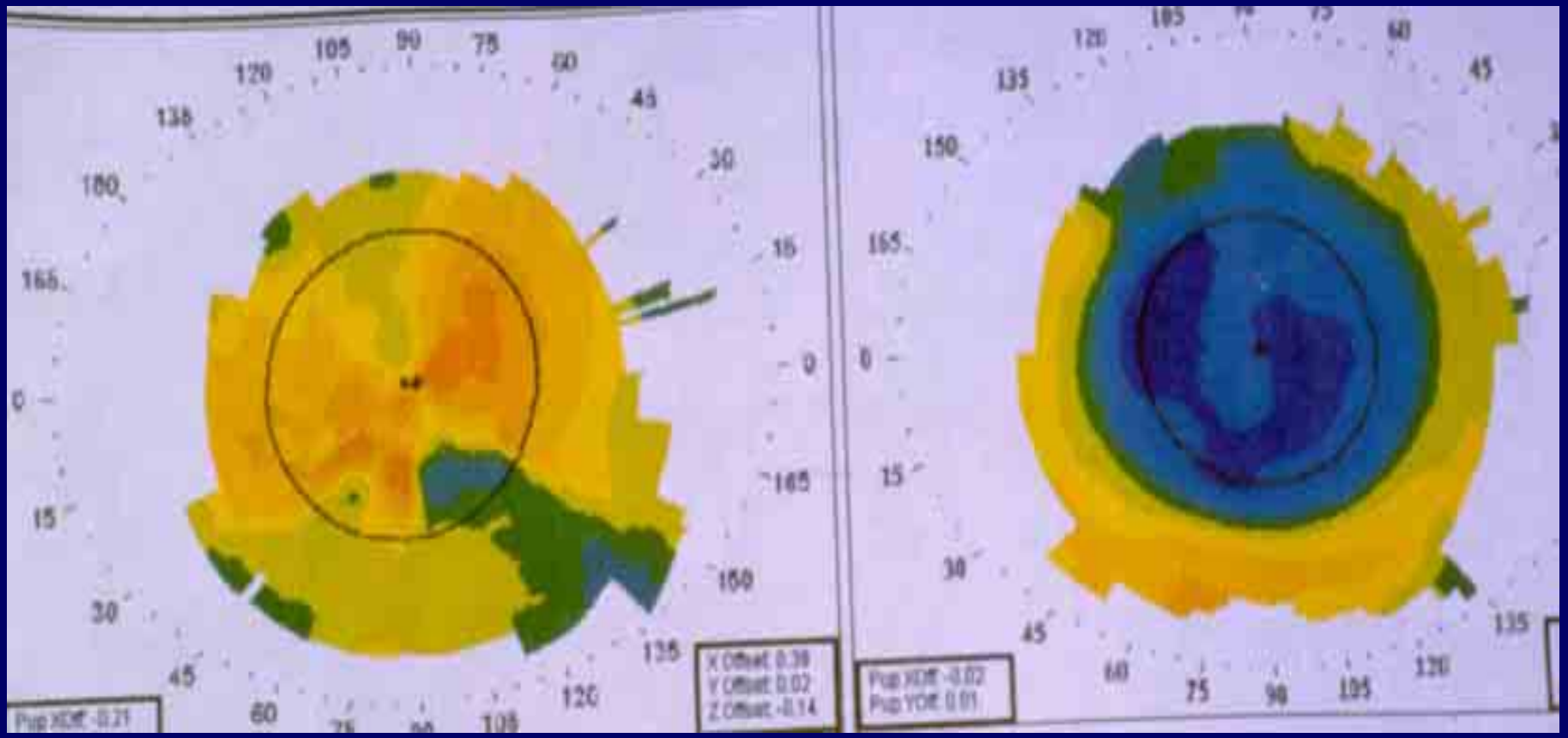


Endothelial cell counts

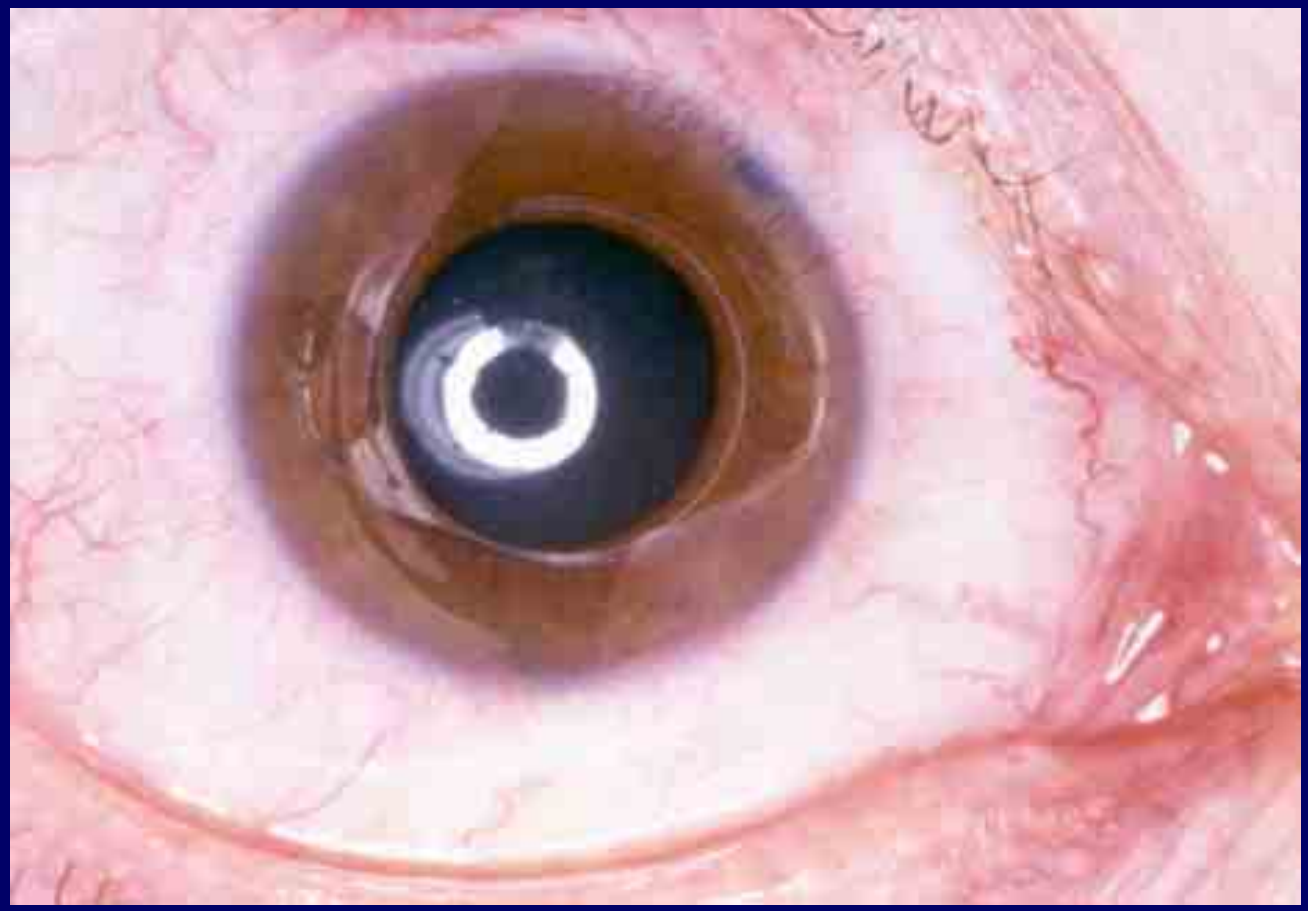
Case report

- 1 patient randomized for one IOL each eye
- Artisan OD: -0.50 –0.50 X 90 UCVA 20/25
- ICL OS: -0.50 UCVA 20/25+
- Outflow facility: unchanged OD (0.285 to 0.286 microL/min/mmHg), **reduced from 0.287 to 0.185)** 35.5% OS

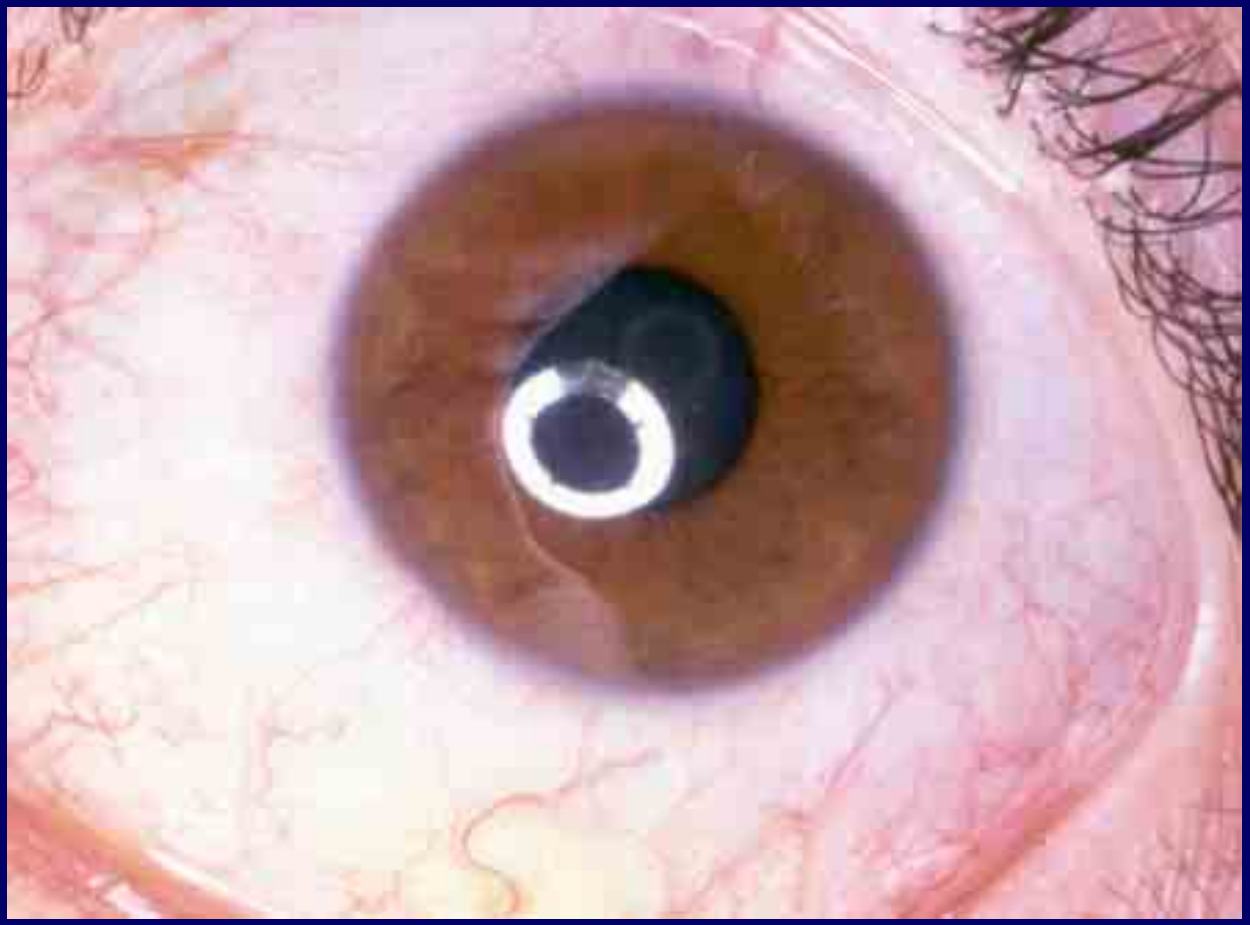
27y/o F –14.00, -9.00



OD Bioptics 6 months postop 20/20



OS Lasik 8 months postop 20/25



Conlcusions

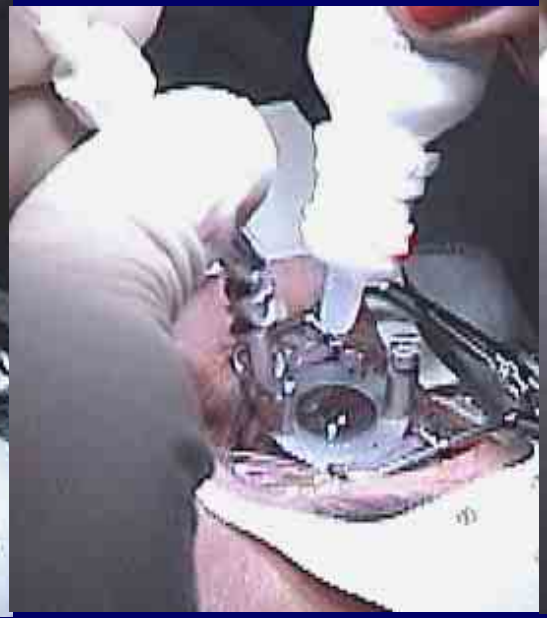
- Good predictable approxim of emmetropia
- Artisan require more surgical skill and elaborative technique
- Away from K, angle, crystalline lens
- Minimal if any ECC loss

My technique

- **1 Drop of Alcaine**
- Betadine scrub and drape eyelids
- Aspirating speculum
- Lubricate blade and rotating parts with Alcaine!!!

Placement of the M2

Push down untill good suction, then lift



Microkeratome pass

Observe patient anxiety and “squeeze”

My technique

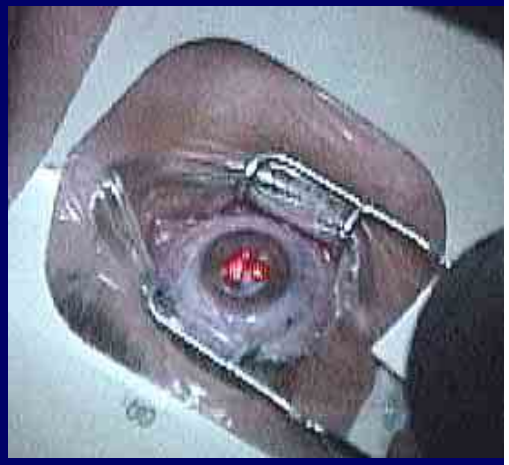
- Fold flap onto itself to minimize

Dehydration and exposure (minimal manipulation)

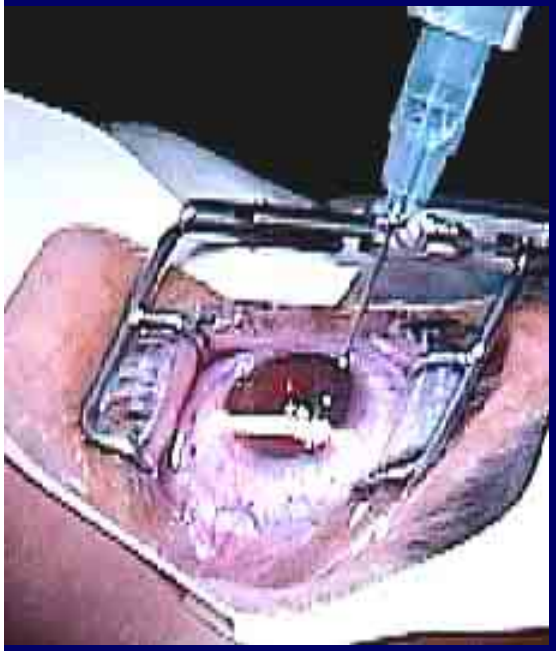
- Even bed hydration –very dry technique (hinge ½ most moist)

ABLATION:
Check parameters! (last chance to avoid error)

Intraoperative moistute eq if needed



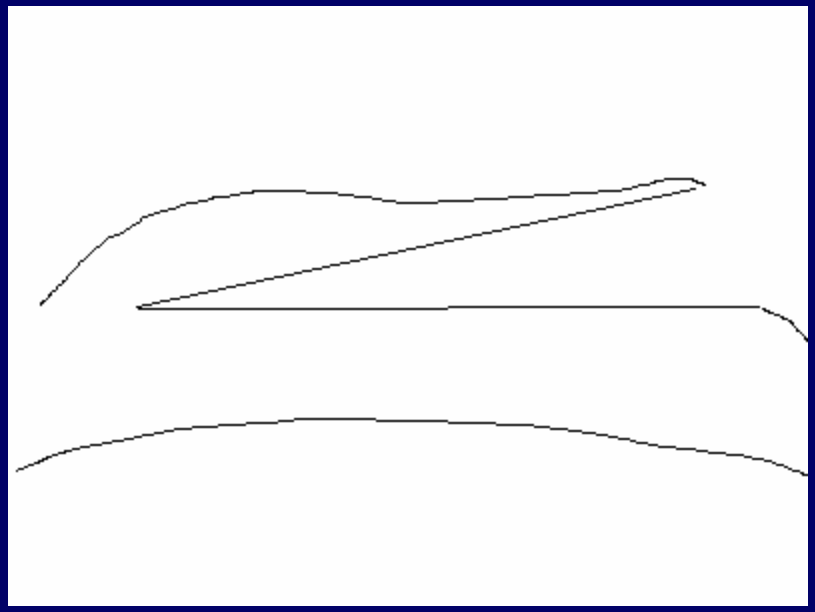
Irrigation of flap and careful wipe (remove fluid from interface)



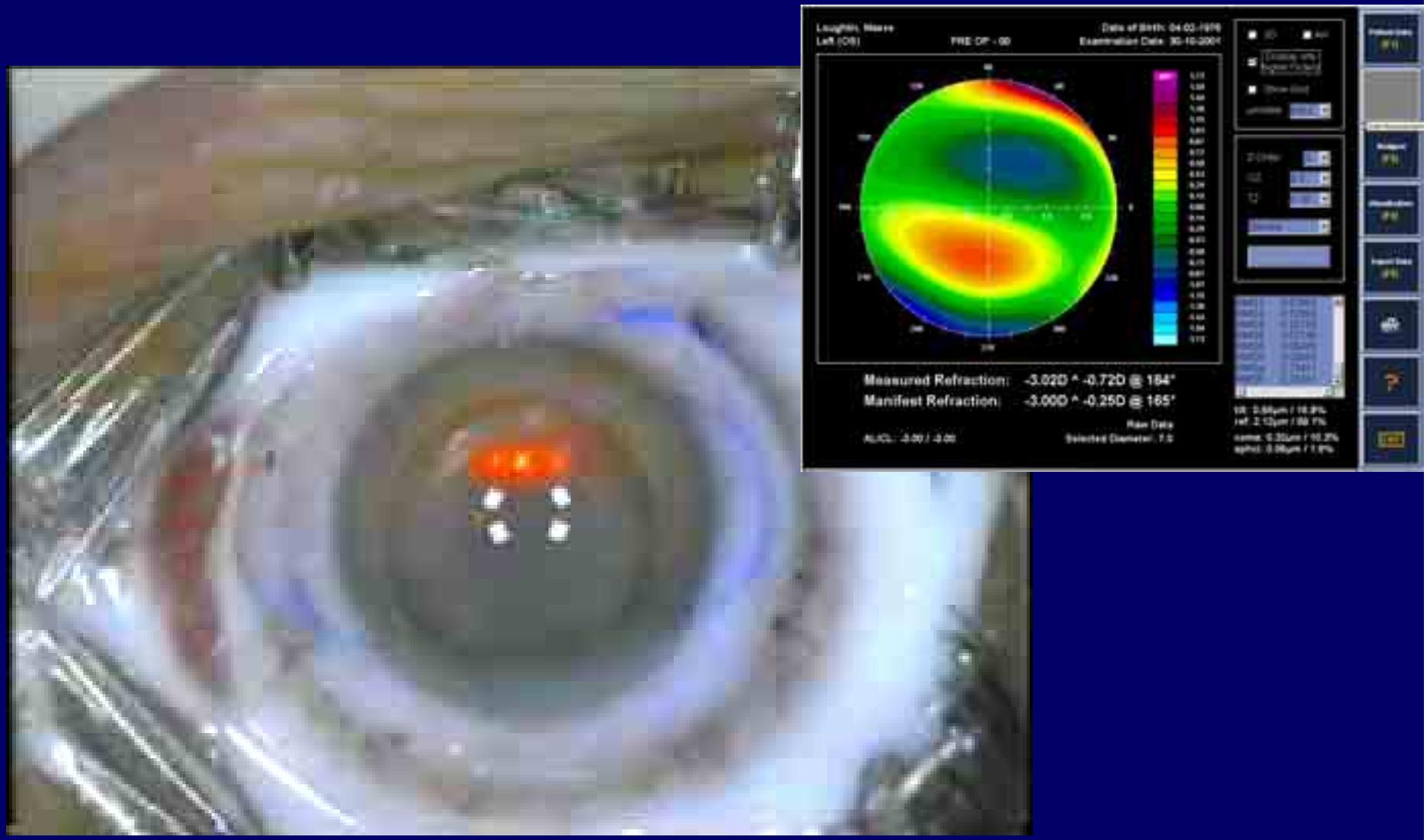
My technique

- Irrigation very important
- “Squeeze” out excees fluid and Striae with moist Weck-cell
- Suspension-opaque drop (predforte 1%) to delineate gutter width, centration and possible striae

Attempt to compensate for irregular hydration state of the flap during the procedure (excimer, procedure speed)

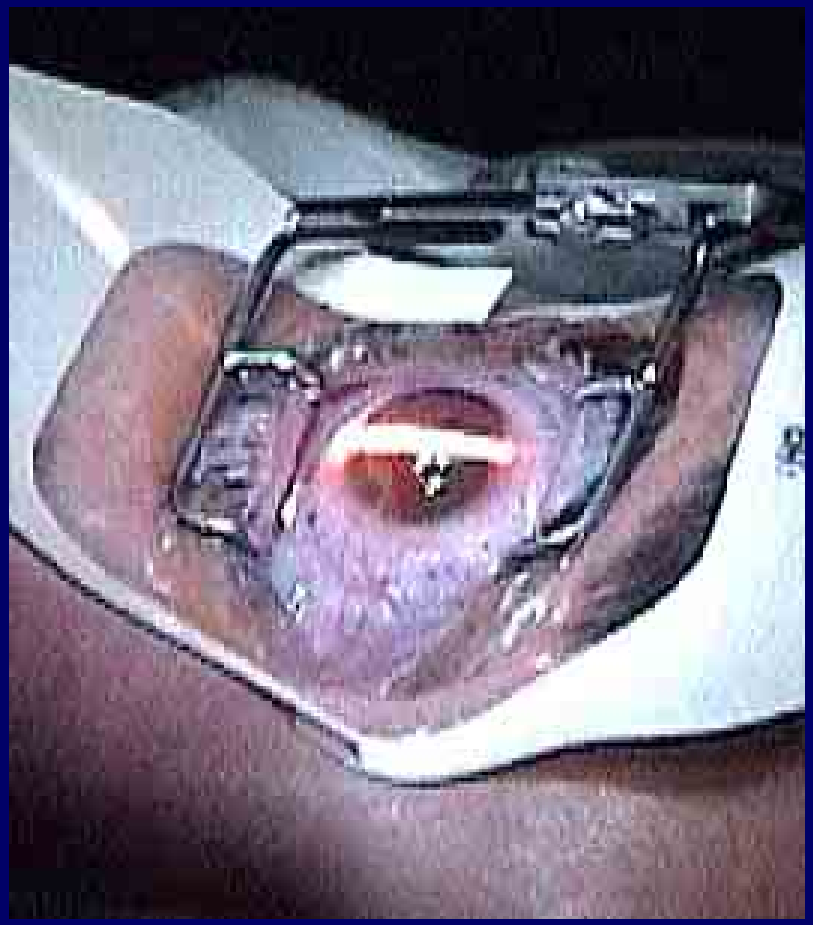


Is the flap back in place?



1’ observation interval

Flap is evaluated with build-in slit-lamp



Video

Conclusion

- **With intelligent pre-operative selection and surgical planning, LASIK can be invaluable in the visual rehabilitation of patients following previous ocular surgery.**

Thank You

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