

Extreme Myopia Treated with Surface Ablation and Smoothing. What Happens Four Years Later ?

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**I do not have any financial interests or
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High Myopia

More than - 6.00 D

(Curtin BJ, Acta Ophthalmol Suppl. 1988)

- **Refractive Surgery Risks:**
 - Undercorrection
 - Haze (amount of corrected myopia ? surface irregularity ?)
 - Regression (induced corneal curvature gradient)
 - Glare
 - Ectasia (LASIK mainly)
 - Myopia progression
 - Retinal problems
- **Accurate patient selection**
- **Complex treatment**
- **Careful follow up**

Why Surface Ablation for High Myopia ?

- Possible to correct:
 - Higher myopia values
 - Very steep/flat corneas
 - Wide pupils
- Less corneal stroma involved:
 - Reduced biomechanical effect
 - Lower risk of ectasia
 - Better contrast sensitivity

*Roberts, C, J Cataract Refract Surg, Jan 2005; Langrova H, Acta Medica, Jan 2003
Shahinian L, J Cataract Refract Surg, Aug 2002; Gambato C, Ophthalmology, Feb 2005*

PRK for Extreme Myopia Surgical Technique

- Retrospective study: 2000 – 2002
- Myopia of -10.00 D SE or more
- NIDEK EC 5000 excimer laser
- Multiple optical zones
 - Ablation zone (AZ): 4.8 – 7.0 mm
 - Add 3 mm at least of transition zone
 - Cross-cylinder technique for astigmatism
- Smoothing with masking fluid

Materials and Methods

- Standard exclusion criteria
- 45 eyes, 32 patients
- Mean age 34.5 ± 7.9 years (range: 21 to 56)
- Corneal thickness: $553.9 \pm 31.8 \mu$

Preoperatively (mean \pm SD):

- VA: 0.81 ± 0.18
- cycloplegic SE : -11.09 D \pm 1.36 D
 - (range: -10.00 to -14.25)
- Sphere : -8.86 D \pm 1.83 D (range: -7.00 to -14.25)
- Cyl : -1.39 D \pm 0.90 D (range: -0.00 to -3.75)

Smoothing

- Corneal irregularities induced by:
 - overlapping ablating shots
 - ocular motion
- Irregular surface induces:
 - excessive healing response
 - haze
 - regression

Vinciguerra P, J Refract Surg 1998

Netto MV, Eye Res 2005

Vinciguerra P, Camesasca F, Refractive Surface Ablation, Slack 2006



Smoothing

- **Surgical Technique:**
 - **Masking fluid** (hyaluronic acid 4%), same ablation rate as normal cornea
 - Careful, continuous distribution with spatula
 - **10 mm diameter** ablation to avoid refractive change
 - 10 Hz frequency to avoid overheating
 - Limited to 10 μ of total ablation
 - Irregularity peaks will appear and be ablated

Vinciguerra P, J Refract Surg 1998

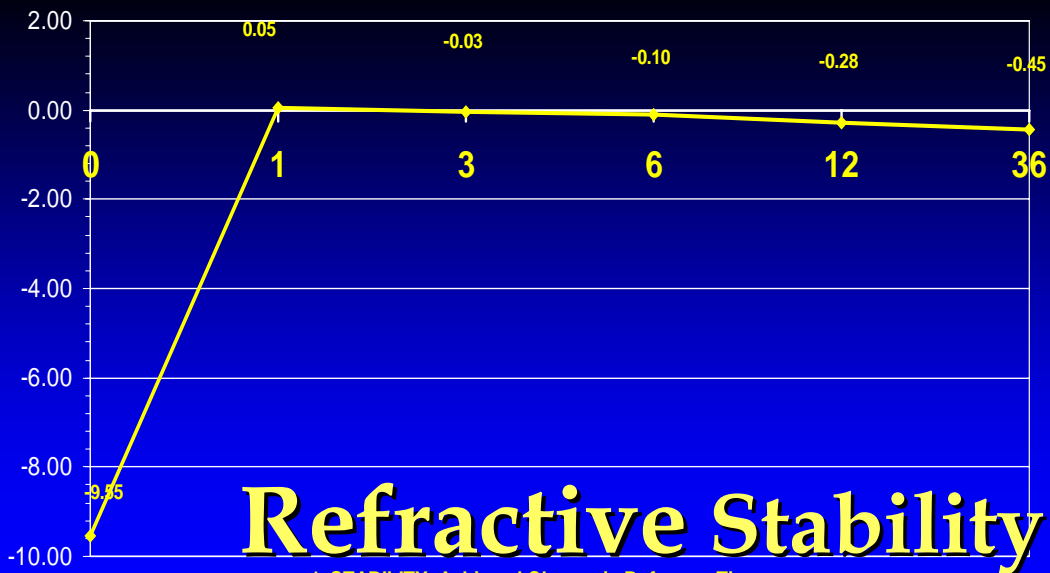
Vinciguerra P, Camesasca F, Refractive Surface Ablation, Slack 2006

Results

Long-Term Follow-Up: **3.1** \pm 1.6 yrs

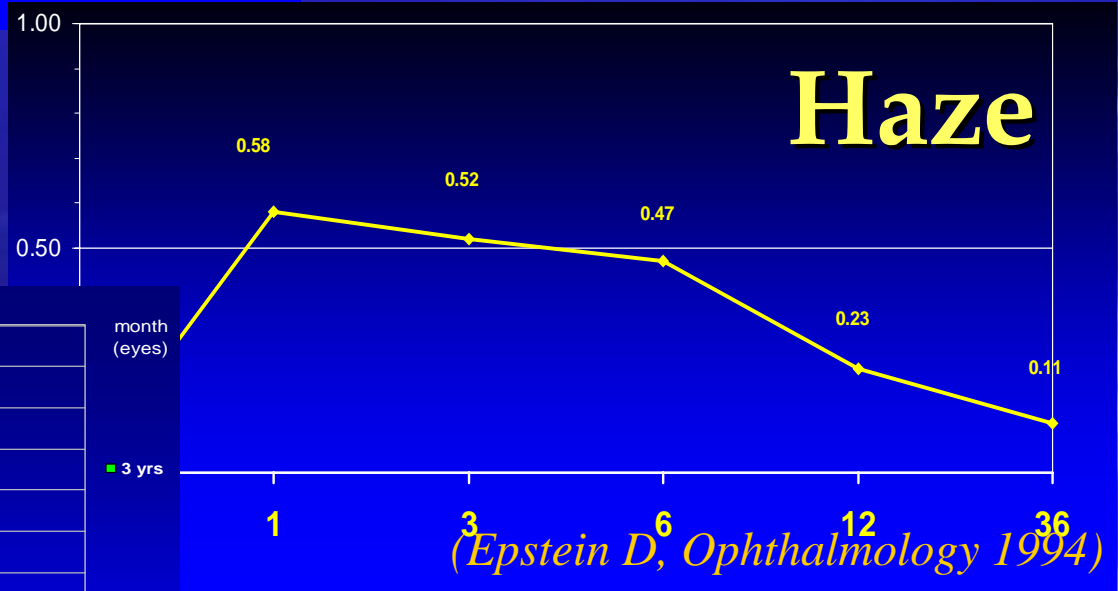
(range 509 - 1920 days)

- UCVA 0.79 ± 0.26
- BSCVA: 0.89 ± 0.18
- SE **-0.36** D ± 0.44 D (range 0.00 to -2.50)
- *Sphere*: **-0.26** D ± 0.83 D (-2.50 to +0.25)
- *Cyl* : **-0.37** D ± 0.46 D (-0.00 to -1.50)
- Haze (0 to 4+): **0.11** ± 0.32



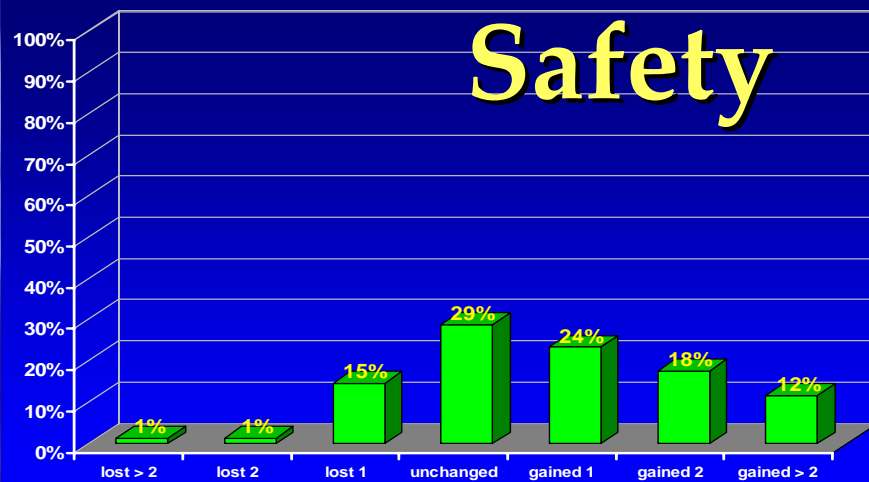
Refractive Stability

1. STABILITY: Achieved Change in Refr. over Time



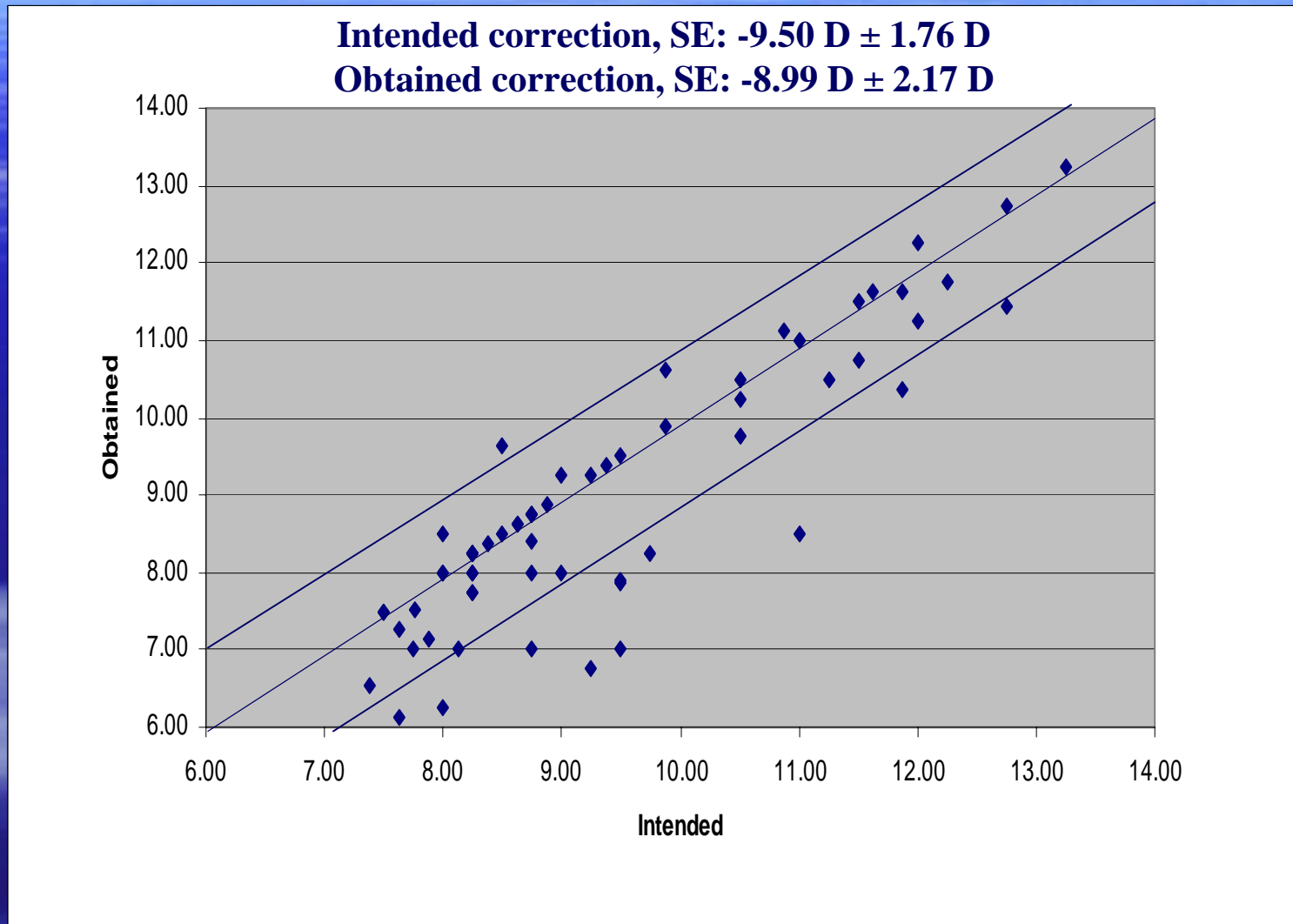
Haze

(Epstein D, Ophthalmology 1994)



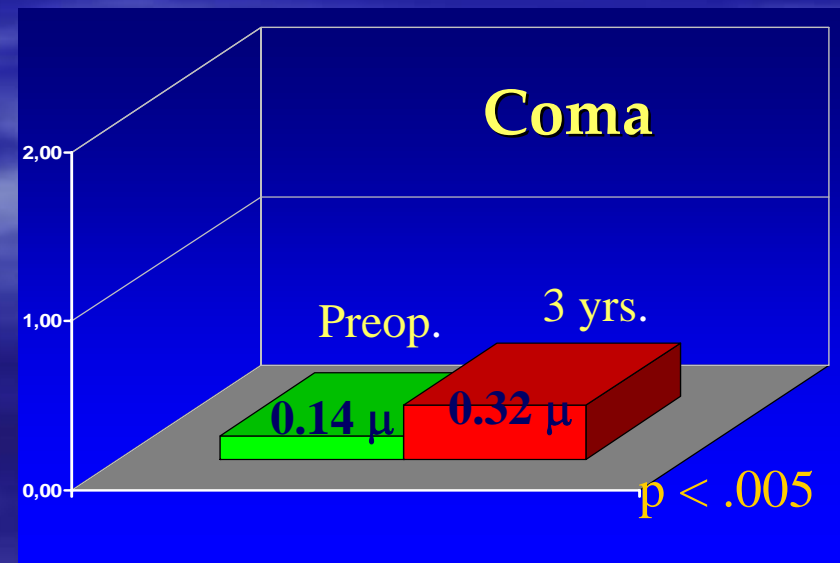
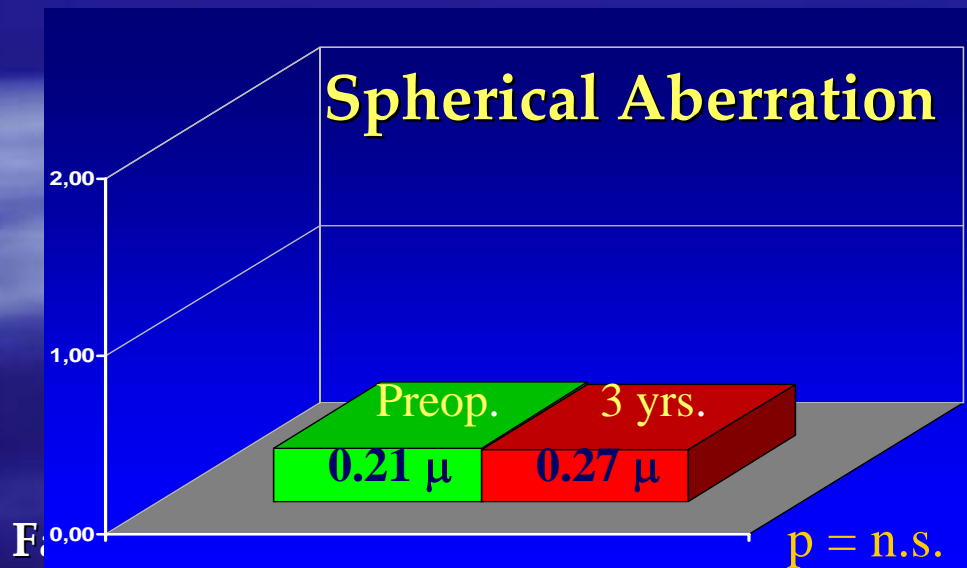
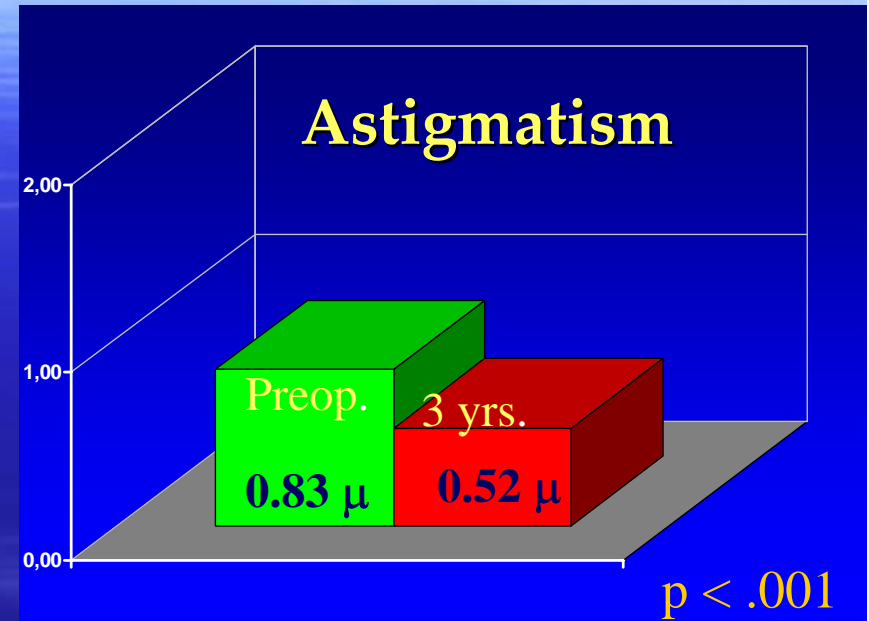
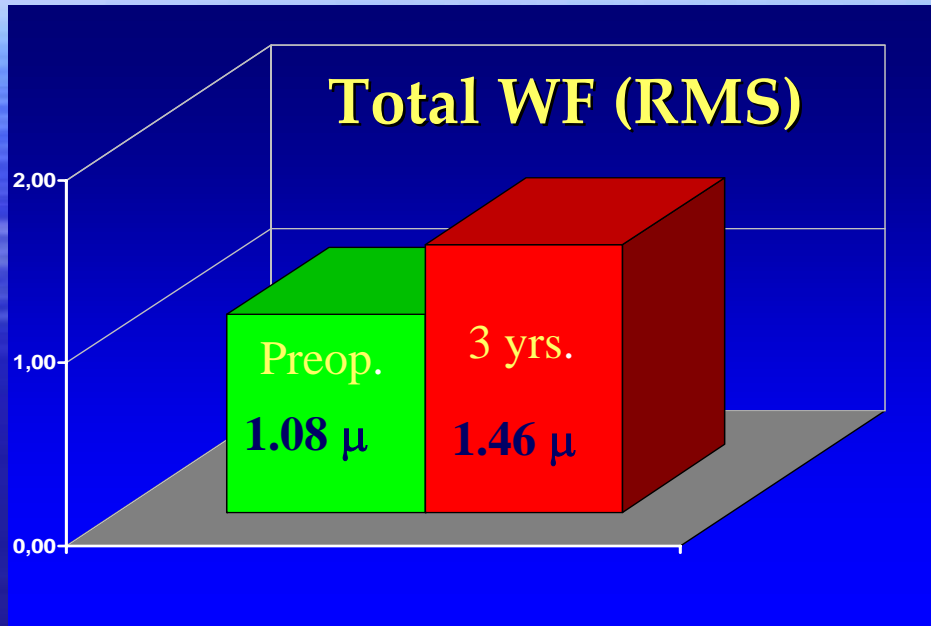
SAFETY: Change in BSCVA - Percent

Intended vs. Obtained



Corneal Aberrometry

(5 mm pupil)



Aberrations

- No increase in postoperative spherical aberration
- Coma increased (no tracking available)

Complications

- Retreatments:
 - 2 **hypercorrected** eyes (2%) (same patient, 67 y.o.)
- Corneal **haze**: 0.11 ± 0.32 at year 3
- **No** ectasia
- **No** retinal detachment
- **No** PTK-induced hyperopia

High Myopia

- Extremely wide, peripheral transition zone:
 - Less induced **spherical aberration**
 - Better vision quality
 - Less halos at night
 - Lower corneal curvature gradient
 - Reduced collagen deposition
 - Less **regression**
- **Smoothing** creates a regular surface, decreasing:
 - haze
 - regression
- Long term stability even with thin corneas...

Nepomuceno RL, J Cataract Refract Surg, Feb 2005

Vinciguerra P, Cataract and Refractive Surg, Jan 2005

Surface Ablation for High Myopia *Conclusions*

- The most happy patients
- High level of accuracy
- No ectasia
- Smoothing:
 - Modulation of corneal healing process
 - No regression
 - Limited or absent haze

*(Gambato C, Ophthalmology, 2006
Wilson, SE, Exp Eye Res, 2006)*