High Risk LASIK Patients
Do you feel lucky?

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Traditional Risk Assessment
• Randelman Scale
  – What’s the point
  • Topography (unilateral keratoconics?)
  • Residual stromal bed (only measured in very few cases, mostly calculated)
  • Age?
• Preoperative corneal thickness
• Preoperative spherical equivalent

Real Risk of Ectasia

Enormous Dataset
Statistical Significance...

• 109,924 consecutive LVC Treatments (60,071 Patients) from April 1st, 2010 to June 30th, 2011.
  • Follow-up availability as follows: 1 Week 79,695 (72.5%) – 1 Month 78,266 (71.2%) – 3 Month 54,684 (49.2%) – 6 Month 21,655 (19.7%)
• Preoperative refractive stratification as follows:
  – Low/Mid Myopia 50,913 (78.9%)
  – High Myopia 3,365 (6.9%)
  – Low/Mid Hyperopia 3,677 (5.5%)
  – High Hyperopia 2,193 (2.0%)
  – Mixed Astigmatism 3,832 (5.5%)
Ongoing Ectasia after LVC Analysis

- **Purpose:** To understand risk factors for ectasia after LVC
- **Methods:**
  - Optical Express data query
  - Treated from 1/1/07 to 4/30/11
  - LASIK and ASA
  - LASIK: Femtosecond or mechanical keratome flaps
  - Standard or WFG
  - Yielded 402,583 eyes of 205,285 patients
  - Observational follow-up 0.5 to 4.5 years
- Ectasia has been observed in 58 patients (0.028%)
- Compare preoperative parameters in ectasia cases and primary cohort

Demographics

<table>
<thead>
<tr>
<th></th>
<th>Ectasia No. (%)</th>
<th>Entire Cohort No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (Mean) (yrs)</strong></td>
<td>31.1</td>
<td>38.2</td>
</tr>
<tr>
<td><strong>Gender (M/F) (%)</strong></td>
<td>66 / 34</td>
<td>66 / 54</td>
</tr>
<tr>
<td><strong>Preop Sphere (Mean) (D)</strong></td>
<td>-2.90</td>
<td>-1.96</td>
</tr>
<tr>
<td><strong>Preop Cylinder (Mean) (D)</strong></td>
<td>-1.04</td>
<td>-0.81</td>
</tr>
<tr>
<td><strong>Treatment (LASIK / PRK) (%)</strong></td>
<td>90 / 10</td>
<td>80 / 30</td>
</tr>
<tr>
<td><strong>Flap (E / MK) (%)</strong></td>
<td>94 / 46</td>
<td>65 / 37</td>
</tr>
<tr>
<td><strong>Time to Diagnosis (Mean) (mo)</strong></td>
<td>24</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Min, Max (mo)</strong></td>
<td>4, 55</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Estimated RSB (Mean) (µ)</strong></td>
<td>341</td>
<td>374</td>
</tr>
</tbody>
</table>

Estimated Residual Stromal Bed

- **Entire Cohort Mean:** 374µ
- **Ectasia Mean:** 341µ
- Still many ectasia cases with RSB thicker than 300

Pre-op Central Corneal Thickness

- Thinnest of 3 ultrasonic pachymetry readings
- **Entire Cohort Mean:** 545µ, Stdev: 33µ, 2 STD below: 479µ
- **Ectasia Mean:** 530µ

Age

- **Entire Cohort Mean:** 38.2 yrs, Stdev: 11.8 yrs
- **Ectasia Mean:** 31.1 yrs
Preop Sphere
Entire Cohort
Mean: -1.96D
Stdev: 2.53D
Ectasia
Mean: -2.91D

Preop Cylinder
Entire Cohort
Mean: -0.81D
Stdev: 0.77D
Ectasia
Mean: -1.04D

Residual Stromal Bed Sub-study
Measured - Estimated
• Intralase mean -36u +/- 42 (n=13)
• Moria mean -43u +/- 54 (n=22)
MK Flaps were thicker (RSBs were thinner) than anticipated as compared to IL

Risk Factor Scoring System

Our Criticisms of Randleman Study
• Vast majority of RSBs were calculated, and thus incorrectly assumed to be thick, when actually thin
• Many Topos were called normal when actually other eye was scored KC
• Age, CCT, higher myopia, thin RSB mildly associated, but of VERY low predictive value
• Topo is the main determinant
Ocular asymmetry
• Relative scales

Posterior Corneal Float
• What is it?

Belin/Ambrosio Enhanced Ectasia Screening

Post LASIK Ectasia

Float
• Red flags

Asymmetry questions?
First, Fix the Surface…

- Better pre-op data, better quality post-op
  - Artificial Tears. All pts.
  - O-3 FA. Almost all pts.
  - Topical Cyclosporin.
  - Topical Azithromycin
  - Topical steroids
  - Plugs.

Current Risk Assessment

- History of Risk Assessment for corneal surgery
Autoimmune Disease and Ocular Pathology
- KCS
- Scleritis
- Episcleritis
- Keratitis
- Peripheral corneal ulceration
- Choroiditis
- Retinal vasculitis
- Episcleral nodules
- Retinal detachment
- Macular edema

Alio et al. (Ophthalmology 2005)
- LASIK on 42 eye with systemic Rheumatic disease
- No complicaitons

Smith and Maloney Study

<table>
<thead>
<tr>
<th>Disease</th>
<th>Sample size</th>
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<tbody>
<tr>
<td>Crohn's Disease</td>
<td>1</td>
</tr>
<tr>
<td>Fibromyalgia</td>
<td>2</td>
</tr>
<tr>
<td>Crohn's Disease</td>
<td>2</td>
</tr>
<tr>
<td>Psoriatic arthritis</td>
<td>3</td>
</tr>
<tr>
<td>Reiter's Syndrome</td>
<td>2</td>
</tr>
<tr>
<td>Relapsing Polychondritis</td>
<td>1</td>
</tr>
<tr>
<td>Rheumatoid Arthritis</td>
<td>6</td>
</tr>
<tr>
<td>Sjogren's syndrome</td>
<td>1</td>
</tr>
<tr>
<td>SLE</td>
<td>7</td>
</tr>
<tr>
<td>Ulcerative colitis</td>
<td>1</td>
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</tbody>
</table>

New TNF-α inhibitors
- Will drugs like Remicade make these patients even safer for surgery?

PRK vs Lasik
- PRK considered more of a risk than Lasik with autoimmune disease due to healing time and large epithelial defect
RISK WITH LASIK

- No published cases of corneal or scleral melting in post LASIK patient with autoimmune disease . . .

Autoimmune disease is likely less likely to develop ectasia because they would drive fibroblasts to the cornea.

Surgically induced corneal necrotizing keratitis following LASIK in a patient with inflammatory bowel disease.

- Patient had undiscovered severe disease
- Inflammatory corneal disease was responsive to topical and systemic steroids. No relapse for at least 12 months after

Systemic Vasculitis

- Associated with Ulcerative Keratitis (Messmer - Surv Ophthalmol 1999)

Rheumatological Disease

- Lahners reported one case of peripheral keratitis 5 days after LASIK – fully resolved with corticosteroid treatment

Rheumatoid Arthritis

- Pahor ( Ophthalmologica 2001)
- Cataract surgery study
- noted a higher level of postoperative anterior chamber inflammation in the early postoperative period that resolved in all cases.
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**Autoimmune Disease With Strong Association to Corneal Melting**
- Wegener's Granulomatosis
- Relapsing polychondritis
- Polyarteritis nodosa

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**Autoimmune Disease With a Loose Association to Corneal Melting**
- SLE
- Crohn's disease
- Ulcerative colitis

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**Autoimmune Disease With No Associated Corneal Melting**
- Hashimoto's disease
- Reiter's syndrome
- Fibromyalgia

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Autoimmune disease indirectly linked to corneal ulceration
- Graves – lagophthalmos and exposure can cause problems
- Scleroderma – lagophthalmos or severe malnutrition

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**Liability**
- LASIK may not be clinically contraindicated in patients with autoimmune disease, but the FDA labels it as such.

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**Post-op Treatment**
- Any post-op complication should be treated aggressively (like epithelial ingrowth)
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<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of Eyes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rheumatoid Arthritis</td>
<td>29</td>
</tr>
<tr>
<td>SLE</td>
<td>31</td>
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<tr>
<td>Spondylitis</td>
<td>2</td>
</tr>
<tr>
<td>Psoriasis</td>
<td>91</td>
</tr>
<tr>
<td>Crohn’s Disease/UC</td>
<td>67</td>
</tr>
<tr>
<td>Keloids</td>
<td>18</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>44</td>
</tr>
<tr>
<td>Immunosuppressive therapy</td>
<td>56</td>
</tr>
</tbody>
</table>

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- Diabetic Keratopathy
  - SPK
  - Recurrent corneal erosions
  - Neurotrophic keratopathy
  - Tear dysfunction
  - Endothelial dysfunction

  • Increased risk of infection

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**Recurrent Uveitis**

- Patients at high risk of developing recurrent flares of acute anterior uveitis, such as those with spondyloarthropathies should be carefully considered

- A patient developed acute DLK three years after LASIK while he was having a recurrent acute anterior uveitis attack (Diaz-Valle – J Refract Surg 2009)

  - Treated with good results

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- Diabetes and LASIK

  • Shown to be safe if patient is well controlled

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**Diabetes and Eye Disease**

- Diabetic Keratopathy
  - SPK
  - Recurrent corneal erosions
  - Neurotrophic keratopathy
  - Tear dysfunction
  - Endothelial dysfunction

  • Increased risk of infection

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**Nerve Regeneration**

- Topical cyclosporine significantly improved corneal sensitivity at 3 months post LASIK (Peyman – J Refract Surg 2008)

  • Suggests that Restasis may enhance nerve regeneration
New Study on Nerve Regeneration
• Allergan Post Lasik study

Risk
Lasik vs Contact lens wear
• Risk to eye health and permanent vision loss
• RGP's are still safer than LASIK
• Daily wear lenses are equally safe to LASIK (ONLY IF THE PATIENT IS 100% COMPLIANT)
• Extended wear carries more patient risk than LASIK

Diabetes
• Stability Issues
• Protective against ectasia?

Herpes
• Simplex vs Zoster

Laser in situ keratomileusis in patients with a history of ocular herpes.
• Laser in situ keratomileusis was safe in patients with a history of ocular herpes
• inactive for 1 year before surgery
• perioperative systemic antiviral prophylaxis

Herpes
• Dormancy
Hx of Keloid Scarring

Systemic Meds
- General precautions
- Obtaining clearance

Steroids

Immunosuppressants

Accutane
- Lack published reports of complications with LASIK.
- Don’t test it.
- Accutane = severe dry eye (temporary)
  - Decrease photoreceptor turnover (night blindness)
  - LASIK = possible dry eye (femto probably not)

Imitrex and LASIK
- Triptans and the incidence of epithelial defects during laser in situ keratomileusis.
  - There is no correlation between the use of sumatriptan for relief of migraine headaches and the generation of epithelial defects during LASIK. There appears to be no reason to stop triptans before proceeding with LASIK.
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Patient Populations
- Be careful of generalizing patients

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Monocular Patients

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Pregnancy
- Decreased Corneal sensitivity
- Increased corneal thickness and curvature

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Ocular Surface DX
- Liability vs Results

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Amblyopes

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Blepharitis
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**Allergy**

• Atopic disease has been historically linked to DLK, haze and myopic regression after PRK (Yang – AmJ Ophthalmol 1998)

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**Comorbidities and Flap Stability**

• Does ocular surface disease decrease flap stability

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**Macro Striae Case**

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**Steepness/Topography**

• Too steep vs Too flat

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**Keratoconus**

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Keratoconus

- LASIK with Riboflavin

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Forme Fruste KK

- Do We Dare?

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Recurrent Corneal Erosions

• Are they ever stable?
• How bad can they get?

Perisurgical prophylaxis

LASIK vs Surface Ablation

Previous RK
Thank You
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