Photoablative Surgery Issues

A basic way to divvy up photoablative surgery complications…
A basic way to divvy up photoablative surgery complications…
Photoablative Surgery Issues

Optical Issues

Structural
Photoablative Surgery Issues

Optical Issues

- Overcorrection
- Undercorrection
- Aberrations

Structural
What is the most common cause of overcorrection?
What is the most common cause of overcorrection?
Stromal dehydration
What is the most common cause of overcorrection?
Stromal dehydration

How does stromal dehydration lead to overcorrection?
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If the stroma is dehydrated, it ablates more readily, and thus more tissue is removed per laser burst
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What surgical factors are common causes of stromal dehydration?
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What surgical factors are common causes of stromal dehydration?
--Allowing too much time to pass between denuding the epithelium/cutting the flap, and ablating the stroma
--Humidity and/or temperature in the excimer room being outside of the manufacturer’s recommendations
**Photoablative Surgery Issues**

- **Optical Issues**
  - **Overcorrection**
  - **Undercorrection**
  - **Aberrations**

**What is the most common cause of overcorrection?**
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**If a pt is overcorrected, how soon should surgical correction be undertaken?**
What is the most common cause of overcorrection?
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If a pt is overcorrected, how soon should surgical correction be undertaken?
As many pts experience some degree of spontaneous regression over the first 3-6 months, it is prudent to allow at least several months to pass before intervening
What is the most common cause of undercorrection?
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--Treating high degrees of myopia or hyperopia
--Spontaneous regression
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What steps can be taken to reduce or even reverse regression leading to undercorrection?
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--Heavy topical steroid use in the post-op period if regression is noted to be ongoing
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If a pt is undercorrected, how soon should surgical correction be undertaken?
Once the refraction has stabilized, which usually takes at least 3 months
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What other complication, if present, should prompt the surgeon to wait even longer?
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What other complication, if present, should prompt the surgeon to wait even longer?
**Post-op haze**--if present, it portends a higher risk for further regression and/or haze formation. In such cases, the prudent course is to wait at least 6-12 months prior to re-treating.
What factors are associated with the presence of post-op aberrations?
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What factors are associated with the presence of post-op aberrations?
--Treating high degrees of myopia, hyperopia or astigmatism
--A smaller ablation zone
--The presence of aberrations pre-op
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Which higher-order aberration is most contributory to pt symptoms?
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--Treating high degrees of myopia, hyperopia or astigmatism
--A smaller ablation zone
--The presence of aberrations pre-op

Which higher-order aberration is most contributory to pt symptoms?
Spherical aberration
Photoablative Surgery Issues

Structural Issues

Photoablative Surgery Issues

Structural Issues

- Central islands
- Decentered ablations
- Steroid-induced IOP elevation
- Central toxic keratopathy
- Infectious keratitis
In this context, what is a central island?
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A small (<1 mm) area of elevation (at least 1D’s worth) within the area of flattening after myopic ablation.
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In terms of symptoms, how does a central island manifest?
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Are central islands a common phenomenon?
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Not with current excimer technology, no.
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As many will regress spontaneously, no.
What are common causes of a decentered ablation?
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--Loss of fixation by the operative eye
--Poor pre-op head positioning by the surgeon
--Failure to ensure the operative eye is oriented perpendicular to the laser
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Will decentration regress spontaneously like a central island?
No, it must be addressed surgically
Decentered ablation
What is the main risk factor for steroid-induced IOP elevation?
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Use after surgery for a prolonged period of time
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Which class of procedure is at increased risk?
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Surface ablation procedures
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Why surface procedures?
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Why surface procedures?
Because steroids are often used for months afterwards to prevent haze formation
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Which class of procedure is at increased risk?
Surface ablation procedures

Why surface procedures?
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Why is managing IOP after photoablative surgery especially challenging?
What is the main risk factor for steroid-induced IOP elevation? Use after surgery for a prolonged period of time.

Which class of procedure is at increased risk? Surface ablation procedures.

Why surface procedures? Because steroids are often used for months afterwards to prevent haze formation.

Why is managing IOP after photoablative surgery especially challenging? Because altered corneal thickness and curvature renders applanation tonometry artifactually low. Likewise, fluid under a LASIK flap can do the same. The only method of measuring IOP that is reliable after photoablative refractive surgery is dynamic contour tonometry.
Central toxic keratopathy

What is central toxic keratopathy?
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The development of acute, nonprogressive central corneal opacification in the immediate post-op period.
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Is it rare, or common? Inflammatory, or noninflammatory?
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Is it rare, or common? Inflammatory, or noninflammatory?
Rare, and noninflammatory
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Is it rare, or common? Inflammatory, or noninflammatory?
Rare, and noninflammatory

What is the cause?
**Photoablative Surgery Issues**

**Central Islands**

**Decentered Ablations**

**Steroid-induced IOP elevation**

**Central toxic keratopathy**

**Infectious keratitis**

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**What is central toxic keratopathy?**
The development of acute, nonprogressive central corneal opacification in the immediate post-op period

**Is it rare, or common? Inflammatory, or noninflammatory?**
Rare, and noninflammatory

**What is the cause?**
It is unknown as of this writing
What is central toxic keratopathy?
The development of acute, nonprogressive central corneal opacification in the immediate post-op period

Is it rare, or common? Inflammatory, or noninflammatory?
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What is the cause?
It is unknown as of this writing

In addition to haze formation, what other undesirable effect does it have?
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The development of acute, nonprogressive central corneal opacification in the immediate post-op period

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In addition to haze formation, what other undesirable effect does it have?
It causes flattening of the anterior cornea, thereby producing a hyperopic shift
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How is it treated?
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In addition to haze formation, what other undesirable effect does it have?
It causes flattening of the anterior cornea, thereby producing a hyperopic shift.

How is it treated?
Hypertonic solutions have been proposed, but their efficacy remains unproven.
Which is more vulnerable to post-op infection--surface ablation, or LASIK?.
Photoablative Surgery Issues

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Surface ablation
Which is more vulnerable to post-op infection--surface ablation, or LASIK?
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Why are surface-based procedures at greater risk for infection?
Which is more vulnerable to post-op infection--surface ablation, or LASIK?
Surface ablation

Why are surface-based procedures at greater risk for infection?
Because the surgical technique involves creating a huge epi defect, thereby stripping the cornea of one of its primary defenses (ie, an intact epithelium). Further, post-op management of surface surgery involves BCLs as well as long-term steroid use, both of which further the risk of bacterial infection.
Which is more vulnerable to post-op infection--surface ablation, or LASIK?
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Which bugs are most commonly implicated?
Which is more vulnerable to post-op infection--surface ablation, or LASIK?

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Which bugs are most commonly implicated?
Gram+ lid flora: *S aureus* (including MRSA), *Strep pneumoniae* and *viridans* spp. Less commonly, atypical mycobacteria, *Nocardia*, and various fungal species have been found.
Which is more vulnerable to post-op infection--surface ablation, or LASIK?
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Are flap-based procedures immune to infection?
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Are flap-based procedures immune to infection?
Definitely not. Bugs sequestered under the flap are shielded from the antimicrobial content of the normal tear film. Treatment requires lifting the flap, scraping it for C&S, and irrigating with abx prior to re-placement.
Infectious keratitis after LASIK
What post-surgical maneuver after surface ablation puts the pt at increased risk for sterile infiltrates?
Q/A

Surface Ablation Issues I: Sterile Infiltrates

- **What post-surgical maneuver after surface ablation puts the pt at increased risk for sterile infiltrates?**
  - The use of a **BCL**, especially in conjunction with the use of topical NSAIDs **without** concurrent **topical steroids**.
Surface Ablation Issues I: Sterile Infiltrates

- What post-surgical maneuver after surface ablation puts the pt at increased risk for sterile infiltrates?
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Post-surface ablation sterile infiltrates
Q  

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- **What are the keys to management of sterile infiltrates?**
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What are the keys to management of sterile infiltrates?
- Make sure it’s sterile (ie, that it’s not infectious)
- Add topical steroids and taper topical NSAIDs
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Post-surface-ablation haze can be divided into two categories based on time of onset--what are they?
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- Early onset
- Late onset
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- Early onset.
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For each, how long after surgery until it appears?
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- Late onset. Six to twelve months.

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For each, at what level in the K is the haze located?
Post-surface-ablation haze can be divided into two categories based on time of onset--what are they?
- Late onset. Six to twelve months. Anterior stroma.

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What are the risk factors for development of severe haze?

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What are the risk factors for development of severe haze?

- Deep ablation
- Small ablation zone
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How is haze treated?
Q/A

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- Increase steroid use. If this fails…
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How is haze treated?
- Increase steroid use. If this fails…
- Debridement in conjunction with topical MMC
Figure 1. Slit-lamp microscopy of a cornea before scraping and mitomycin C treatment. The central scar is dense and leads to an irregular and whitish surface.

Figure 2. The same cornea as Figure 1 after scraping and mitomycin C treatment. Six months after the procedure the corneal tissue is clear and no trace of haze is evident.

Post-surface ablation corneal haze: Pre- and post tx
LASIK Issues I: Cutting The Flap

- Cutting the flap with a microkeratome…problems
  - Adequate suction induces an IOP of at least 65 mmHg
LASIK Issues I: Cutting The Flap

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Cutting the flap with a microkeratome... problems

- Adequate suction induces an IOP of at least 65 mmHg.
- Inadequate suction ↑ the risk of a flap prob 1 or flap prob 2.
**LASIK Issues I: Cutting The Flap**

- **Cutting the flap with a microkeratome**...problems
  - Adequate suction induces an IOP of at least 65 mmHg
  - Inadequate suction ↑ the risk of a thin flap or buttonhole
LASIK flap: Buttonhole
Q

**LASIK Issues I: Cutting The Flap**

- **Cutting the flap with a microkeratome…problems**
  - Adequate suction induces an IOP of at least **65** mmHg
  - Inadequate suction ↑ the risk of a **thin flap** or **buttonhole**
  - A **steep (>46D)** cornea ↑ the risk of a thin flap or buttonhole as well
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  - A flat (<41D) cornea ↑ the risk of a flap prob 3
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LASIK flap: Free cap
Cutting the flap with a microkeratome…problems

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How do you manage a…

- Thin flap/buttonhole?
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  - A steep (>46D) cornea ↑ the risk of a thin flap or buttonhole as well
  - A flat (<41D) cornea ↑ the risk of a free cap

- How do you manage a...
  - Thin flap/buttonhole? Stop the procedure; re-cut in 3-6 months
  - Free cap? Place in antidessication chamber; finish the procedure; re-place the cap +/- sutures
Flap Striae

Two broad category of striae

? ?
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae

Microstriae
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae

Microstriae

[Images of eye with striae]
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

- Macrostriae
- Microstriae

What are the two main risk factors for striae?
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LASIK Issues II: Flap Striae and Dislocation

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Microstriae

What are the two main risk factors for striae?
--Thin flaps
--Deep ablations
LASIK Issues II: Flap Striae and Dislocation

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Macrostriae

Microstriae

Do all striae require treatment?
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae

Microstriae

Do all striae require treatment?
No. If BCVA and subjective VA are good, folds can be observed
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

- Two broad category of striae

  - Macrostriae
  - Microstriae

Thickness
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad categories of striae

- Macrostriae
  - Full flap
- Microstriae
  - Bowman’s layer only

Thickness
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

- Two broad category of striae

- Macrostriae
  - Full flap
  - Thickness
  - Clinically significant?

- Microstriae
  - Bowman’s layer only
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
- Full flap
- Always

Microstriae
- Bowman’s layer only

Clinically significant?

Thickness
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae

Full flap
Always

Thickness
Clinically significant?
Cause

Microstriae
Bowman’s layer only
Rarely
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
- Full flap
- Always
- Flap slippage
- Thickness
- Clinically significant?
- Cause
- Flap contracture

Microstriae
- Bowman’s layer only
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LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
- Full flap
- Always
- Flap slippage

Microstriae
- Bowman’s layer only
- Rarely
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What is probably the most common cause of flap slippage leading to macrostriae?
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
- Full flap
- Always
- Flap slippage
  - Thickness
  - Clinically significant?
  - Cause

Microstriae
- Bowman’s layer only
- Rarely
- Flap contracture

What is probably the most common cause of flap slippage leading to macrostriae?
Eyelid squeezing by the pt upon removal of the speculum
A pt has multiple macrostriae, all oriented parallel to one another. They stem from the hinge. What is the likely cause?
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
- Full flap
- Always
- Flap slippage
  - Thickness
  - Clinically significant?
  - Cause

Microstriae
- Bowman’s layer only
- Rarely
- Flap contracture

A pt has multiple macrostriae, all oriented parallel to one another. They stem from the hinge. What is the likely cause? Frank slippage of the flap. Re-place it immediately!
LASIK flap: Folds from flap slippage
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
Full flap
Always
Flap slippage

Microstriae
Bowman’s layer only
Rarely
Flap contracture

Thickness
Clinically significant?
Cause

A pt has multiple macrostriae, all oriented parallel to one another. They stem from the hinge. What is the likely cause? Frank slippage of the flap. Re-place it immediately!

Why must slippage be addressed immediately?
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
- Full flap
  - Thickness
- Always
  - Clinically significant?
- Flap slippage
  - Cause

Microstriae
- Bowman’s layer only
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- Flap contracture

A pt has multiple macrostriae, all oriented parallel to one another. They stem from the hinge. What is the likely cause? Frank slippage of the flap. Re-place it immediately!

Why must slippage be addressed immediately?
Because if left in place, folds quickly become permanent
**LASIK Issues II: Flap Striae and Dislocation**

### Flap Striae

**Two broad category of striae**

**Macrostriae**
- Full flap
- Always
- Flap slippage

**Microstriae**
- Bowman’s layer only
- Rarely
- Flap contracture

**Thickness**

**Clinically significant?**

**Cause**

---

A pt has multiple macrostriae, all oriented parallel to one another. They stem from the hinge. What is the likely cause? Frank slippage of the flap. Re-place it immediately!

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Because if left in place, folds quickly become permanent

**How quickly?**
Within roughly 24 hours
LASIK Issues II: Flap Striae and Dislocation

**Flap Striae**

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- **Microstriae**
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  - Rarely
  - Flap contracture

**Cause**

**Clinically significant?**

**Thickness**

A pt has multiple macrostriae, all oriented parallel to one another. They stem from the hinge. What is the likely cause? Frank slippage of the flap. Re-place it immediately!

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Two broad category of striae

Macrostriae
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- Always
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Microstriae
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- Flap contracture

Thickness
Clinically significant?
Cause
Gutter status
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae

- Full flap
- Always
- Flap slippage
- Widened

Microstriae

- Bowman’s layer only
- Rarely
- Flap contracture
- Unaffected

Thickness
Clinically significant?
Cause
Gutter status
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
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Microstriae
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- Unaffected

Why do macrostriae tend to widen the flap gutter?

Why do macrostriae tend to widen the flap gutter?

Why do macrostriae tend to widen the flap gutter?
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

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Microstriae
- Thickness
- Clinically significant?
- Cause
- Gutter status
- Bowman’s layer only
- Rarely
- Flap contracture
- Unaffected

Why do macrostriae tend to widen the flap gutter?
Because the folds reduce the surface area the flap can cover
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
- Full flap
- Always
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Microstriae
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Thickness
Clinically significant?
Cause
Gutter status
Acute treatment
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

- Macrostriae
  - Full flap
  - Always
  - Flap slippage
  - Widened
  - Lift and replace
- Microstriae
  - Bowman’s layer only
  - Rarely
  - Flap contracture
  - Unaffected
  - Observation; lubrication

Thickness
Clinically significant?
Cause
Gutter status
Acute treatment
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

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Thickness
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Classic description
LASIK Issues II: Flap Striae and Dislocation

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Two broad category of striae

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</tr>
<tr>
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<td>‘Cracked mud’</td>
</tr>
</tbody>
</table>

- Thickness
- Clinically significant?
- Cause
- Gutter status
- Acute treatment
- Classic description
Flap Striae

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- ‘Cracked mud’

Thickness
Clinically significant?
Cause
Gutter status
Acute treatment
Classic description

What clinical maneuver helps bring out the cracked mud appearance?
**LASIK Issues II: Flap Striae and Dislocation**

Flap Striae

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- Full flap
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- Lift and replace
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Microstriae
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- Rarely
- Flap contracture
- Unaffected
- Observation; lubrication
- ‘Cracked mud’

**Clinically significant?**

**Cause**

**Thickness**

**Gutter status**

**Acute treatment**

**Classic description**

**What clinical maneuver helps bring out the cracked mud appearance?**

**Instillation of fluorescein.** The microstriae will be visualized as areas of negative staining.
Microstriae: ‘Cracked mud’ appearance after fluorescein instillation
**LASIK Issues II: Flap Striae and Dislocation**

Flap Striae

Two broad category of striae

### Macrostriae
- Full flap
- Always
- Flap slippage
- Widened
- Lift and replace
- ‘Skewed carpet’

#### Clinically significant?

#### Cause

#### Gutter status

#### Acute treatment

#### Classic description

#### Visible w/ direct illumination

### Microstriae
- Bowman’s layer only
- Rarely
- Flap contracture
- Unaffected
- Observation; lubrication
- ‘Cracked mud’
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

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Microstriae
- Bowman’s layer only
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- Flap contracture
- Unaffected
- Observation; lubrication
- ‘Cracked mud’

Thickness
Clinically significant?
Cause
Gutter status
Acute treatment
Classic description
Visible w/ direct illumination

Yes
No
A pt is found to have **circumferential** striae. What was likely her pre-op refractive status?
LASIK Issues II: Flap Striae and Dislocation

Flap Striae

Two broad category of striae

Macrostriae
- Full flap
- Always
- Flap slippage
- Widened
- Lift and replace
- ‘Skewed carpet’
- Yes

Microstriae
- Thickness
- Clinically significant?
- Cause
- Gutter status
- Acute treatment
- Classic description
- Visible w/ direct illumination
- Yes

Clinically significant?

Cause

Gutter status

Acute treatment

Classic description

Visible w/ direct illumination

Clinically significant?

Two broad category of striae

Yes

Macrostriae

Microstriae

A pt is found to have circumferential striae. What was likely her pre-op refractive status?
High myopia
A pt is found to have circumferential striae. What was likely her pre-op refractive status?
High myopia

Are circumferential striae more or less concerning than other types of striae?
### LASIK Issues II: Flap Striae and Dislocation

**Flap Striae**

Two broad category of striae

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</tr>
<tr>
<td>‘Skewed carpet’</td>
<td>Classic description</td>
</tr>
</tbody>
</table>
| Yes                          | Visible w/ direct illumination |}

**Acute treatment**

- Observation; lubrication
- 'Cracked mud'

**Cause**

- Flap contracture
- Unaffected

**Clinically significant?**

- Rarely
- Yes No

**Gutter status**

- Unaffected

**Thickness**

- Bowman’s layer only

**Visible w/ direct illumination**

- No

---

*A pt is found to have circumferential striae. What was likely her pre-op refractive status?*

High myopia

---

*Are circumferential striae more or less concerning than other types of striae?*

Less. They usually resolve spontaneously.
LASIK Issues II: Flap Striae and Dislocation

- Flap dislocation
  - Early
    - Often occurs on post-op day

#
LASIK Issues II: Flap Striae and Dislocation

- Flap dislocation
  - *Early*
    - Often occurs on post-op day 1
Flap dislocation

Early

- Often occurs on post-op day 1
  - In immediate post-op period, adhesion between flap epithelium and tarsal conj can be stronger than tensile strength of epithelial bridge across flap gutter
LASIK flap: Early post-op dislocation
Flap dislocation

- **Early**
  - Often occurs on post-op day 1
    - In immediate post-op period, adhesion between flap epithelium and tarsal conj can be stronger than tensile strength of epithelial bridge across flap gutter

- **Late**
  - Usually secondary to
Flap dislocation

**Early**
- Often occurs on post-op day 1
  - In immediate post-op period, adhesion between flap epithelium and tarsal conj can be stronger than tensile strength of epithelial bridge across flap gutter

**Late**
- Usually secondary to blunt trauma
Flap dislocation

Early
- Often occurs on post-op day 1
  - In immediate post-op period, adhesion between flap epithelium and tarsal conj can be stronger than tensile strength of epithelial bridge across flap gutter

Late
- Usually secondary to blunt trauma
  - Some healing/scarring occurs at the edge, but essentially none at the rest of the flap/stroma interface
  - Lack of extensive healing means flap is always vulnerable to dislocation from blunt force
Flap dislocation

**Early**
- Often occurs on post-op day 1
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**Late**
- Usually secondary to blunt trauma
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Flap dislocation

**Early**
- Often occurs on post-op day 1
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- Usually secondary to **blunt trauma**
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  - Lack of extensive healing means flap is always vulnerable to dislocation from blunt force

**Treatment:** Re-place flap ASAP!
Flap dislocation

- **Early**
  - Often occurs on post-op day 1
    - In immediate post-op period, adhesion between flap epithelium and tarsal conj can be stronger than tensile strength of epithelial bridge across flap gutter

- **Late**
  - Usually secondary to blunt trauma
    - Some healing/scarring occurs at the edge of the flap, but essentially none at the rest of the flap/stroma interface
    - Lack of extensive healing means flap is always vulnerable to dislocation from blunt force

- **Treatment:** Re-place flap ASAP!
LASIK flap: Late, traumatic dislocation
LASIK Issues III: DLK

- DLK…
  - …stands for...
LASIK Issues III: DLK

- DLK…
  - …stands for *diffuse lamellar keratitis*
LASIK Issues III: DLK

- DLK…
  - …stands for *diffuse lamellar keratitis*
  - aka funny nickname for its grainy appearance
LASIK Issues III: DLK

- DLK…
  - …stands for *diffuse lamellar keratitis*
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LASIK Issues III: DLK

- DLK...
  - ...stands for *diffuse lamellar keratitis*
  - aka *Sands of Sahara* for its grainy appearance
  - ...is a [infectious vs non-] inflammation of the interface
DLK…
- …stands for *diffuse lamellar keratitis*
- aka *Sands of Sahara* for its grainy appearance
- …is a *noninfectious* inflammation of the *flap-bed* interface
Q

LASIK Issues III: DLK

- DLK...
  - ...stands for **diffuse lamellar keratitis**
  - aka **Sands of Sahara** for its grainy appearance
  - ...is a **noninfectious** inflammation of the **flap-bed** interface
  - ...is probably 2° to a **very general process** of the **LASIK location**
A

**LASIK Issues III: DLK**

- DLK...
  - ...stands for *diffuse lamellar keratitis*
  - aka *Sands of Sahara* for its grainy appearance
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  - ...is probably 2° to *contamination* of the *interface*
LASIK Issues III: DLK

- **DLK**
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LASIK Issues III: DLK

• DLK…
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  • …is a *noninfectious* inflammation of the *flap-bed* interface
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Q

LASIK Issues III: DLK

- DLK…
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  - …has 4 grades:
LASIK Issues III: DLK

- DLK…
  - …stands for *diffuse lamellar keratitis*
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  - …has 4 grades:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Interface appearance</th>
<th>Effect on vision</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 4</td>
<td></td>
<td></td>
<td></td>
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</table>
A/Q

**LASIK Issues III: DLK**

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<th>Grade</th>
<th>Interface appearance</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Granules peripherally</td>
<td>None</td>
<td>Steroid drop q1º</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Dense central granules</td>
<td>Decreased</td>
<td>Prednisone + lift flap and irrigate</td>
</tr>
<tr>
<td>4</td>
<td>Scarring</td>
<td>Decreased</td>
<td>No good tx</td>
</tr>
</tbody>
</table>
**A/Q**

**LASIK Issues III: DLK**

- **DLK...**
  - ...stands for *diffuse lamellar keratitis*
  - aka *Sands of Sahara* for its grainy appearance
  - ...is a noninfectious inflammation of the *flap-bed* interface
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  - ...has 4 grades:

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<tr>
<th>Grade 1</th>
<th>Interface appearance</th>
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<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Granules peripherally</td>
<td>None</td>
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</table>

<table>
<thead>
<tr>
<th>Grade 2</th>
<th>Interface appearance</th>
<th>Effect on vision</th>
<th>Treatment</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Granules peripherally + centrally</td>
<td>None</td>
<td>PF q1º + PO prednisone</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade 3</th>
<th>Interface appearance</th>
<th>Effect on vision</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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A/Q

**LASIK Issues III: DLK**

- **DLK**…
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  - aka **Sands of Sahara** for its grainy appearance
  - …is a **noninfectious** inflammation of the **flap-bed** interface
  - …is probably 2º to **contamination** of the **interface** (with **rust**, **RBCs**, **bacterial products**, etc)
  - …has 4 grades:

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</tr>
<tr>
<td>Grade 3</td>
<td>Dense central granules</td>
<td>Decreased</td>
<td>PF q1º + PO prednisone + lift flap and irrigate</td>
</tr>
<tr>
<td>Grade 4</td>
<td></td>
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LASIK Issues III: DLK

DLK…

- …stands for diffuse lamellar keratitis
  - aka Sands of Sahara for its grainy appearance
- …is a noninfectious inflammation of the flap-bed interface
- …is probably 2o to contamination of the interface (with rust, RBCs, bacterial products, etc)
- …has 4 grades:

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Stage 3

Stage 4

DLK
## LASIK Issues III: DLK

### DLK vs Infectious Keratitis after LASIK

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<tbody>
<tr>
<td><strong>Time of onset</strong></td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td><strong>(post-op)</strong></td>
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<td></td>
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**Q**

**DLK vs Infectious Keratitis after LASIK**
**LASIK Issues III: DLK**

- **DLK vs Infectious Keratitis after LASIK**

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- Photosensitivity: Yes
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- **Location**
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- **DLK vs Infectious Keratitis after LASIK**

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- The patient with a POChx of **HSV keratitis**
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What is the concern re operating on patients with a history of HSV keratitis?
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What is the concern re operating on patients with a history of HSV keratitis?
Re-activation of the virus
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- The patient with a POcHx of **HSV keratitis**
- The patient with a POcHx of different abb.
These patients should give you pause before proceeding with ablative keratorefractive surgery:

- The patient with a POcHx of **HSV keratitis**
- The patient with a POcHx of **DES** *(Dry-eye syndrome)*
These patients should give you pause before proceeding with ablative keratorefractive surgery:

- The patient with a POchx of **HSV keratitis**
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- The patient with PMHx of **two words**
Photoablative Surgery: Other Issues

- These patients should give you pause before proceeding with ablative keratorefractive surgery:
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Keratoconus—forme fruste or otherwise

This assertion is technically incorrect. Keratoconus is certainly a contraindication for RK as well as keratoablative procedures such as LASIK and PRK. However, there is a keratorefractive procedure that is not only not contraindicated in keratoconus, it can be used to treat keratoconus. What is it?

Corneal inlay (ie, Intacs) procedure
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Even this is not universal--there are good and honorable surgeons who will perform keratoablative refractive surgery on forme fruste patients.
In this context, what does ectasia refer to?
In this context, what does ectasia refer to? A noninflammatory, progressive disorder of corneal biomechanics which leads to thinning and warping
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Ectatic disorders include:
- two words
- three words
- one word
- three words
- abb.
In this context, what does ectasia refer to? A noninflammatory, progressive disorder of corneal biomechanics which leads to thinning and warping.

- Ectatic disorders include **pellucid marginal degeneration**, **keratoglobus**, **Terrien marginal degeneration**, and **KCN**.
KCN Keratoglobus

Pellucid marginal degeneration

Keratoglobus

Terrien marginal degeneration
In this context, what does ectasia refer to? A noninflammatory, progressive disorder of corneal biomechanics which leads to thinning and warping.

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Is post-surgery ectasia more common after LASIK, or surface procedures?
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While there are many risk factors, two dwarf the others in importance. What are they?

- 
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Photoablative Surgery: Speaking of Ectasia…

211
● In this context, what does ectasia refer to? A noninflamatory, progressive disorder of corneal biomechanics which leads to thinning and warping
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What is the tx?
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What is the tx? RGPs; CXL +/- ICRS; PK.