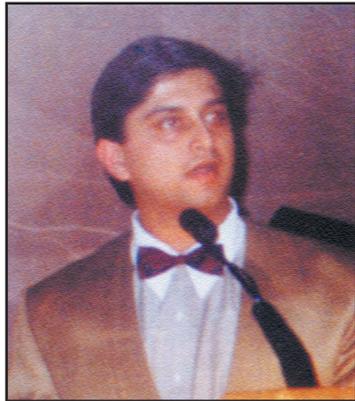


# EYE NEWS



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**ARUN C. GULANI, M.D.**  
Director of Refractive Surgery,  
University of Florida, U. S. A.

With Laser Assisted In-Situ Keratomileusis (Lasik) having established itself on the refractive surgery frontier, we have come to recognize the potential fatalities associated with it and effective management of the same. With the advent of the Excimer laser we have come to expect micron precision in our pursuit of emmetropia. The Excimer laser is inherently non-homogenous and various

## New Classification Systems and Management Guides for Corneal Complications of Lasik

beam shaping techniques have been used to address the same. [Gulani AC. "See & Watch the invisible Excimer laser in Lasik"- ASCRS, Boston. May 2000]

Preventive efforts and attention to detail was never more applicable than in this micron-precise surgery. It is important to therefore shed our routine surgical complication nomination and adapt to the present era of "Micron thinking" and analysis.

In this direction, I have proposed a new classification to summarize, nominate and better comprehend Lasik complications. [Gulani AC. "New Stratified Classification System for Lasik Complications". AAO. Orlando, Oct 1999]

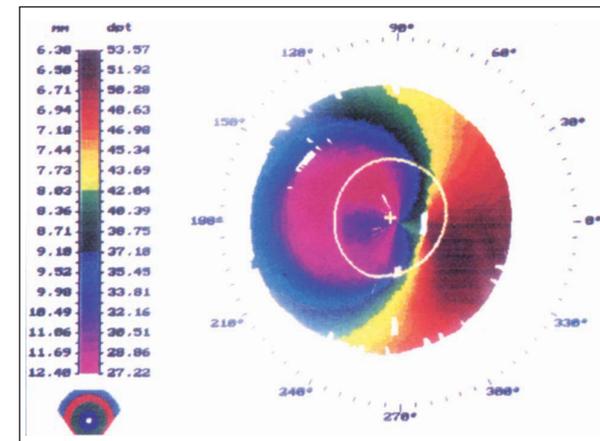
We need to visualize the Lasik tissue components as comprising of three basic tiers (Levels):

The **Corneal section** implies the corneal flap prepared by the microkeratome pass and comprises of the corneal flap and hinge. The hinge is the portion of the flap by which it is attached to the remaining corneal bed and over-turned upon to expose the underlying stromal bed:

The **Ablation bed** is the exposed stromal bed following the preparation of the corneal section and is the template for Excimer laser sculpting.

The **Interface** is the potential area between the repositioned corneal flap and the stromal bed following Excimer

### 3. Stromal bed (Level III)



#### Decentered Ablation

laser ablation.

The various corneal complications of Lasik have been assigned to their respective level of affliction in the cornea.

The **3-Tier Classification** gives a comprehensive, yet lucid visualization of the Lasik corneal complications. It can also be updated periodically as we encounter newer complications in our ongoing educative endeavor to achieve emmetropia using Lasik.

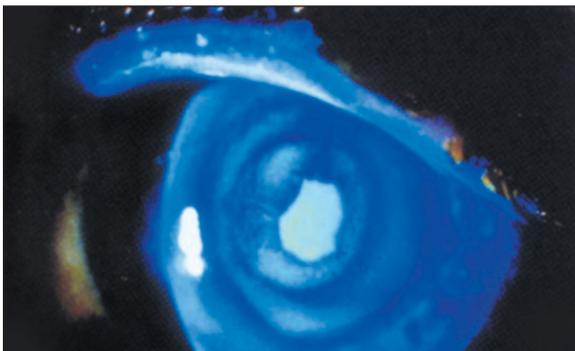
The corneal complications arising following Lasik were qualitatively designated to their respective levels in the three tier Classification form, eg.

#### Level I (Corneal Section)

Flap: Epithelial tear

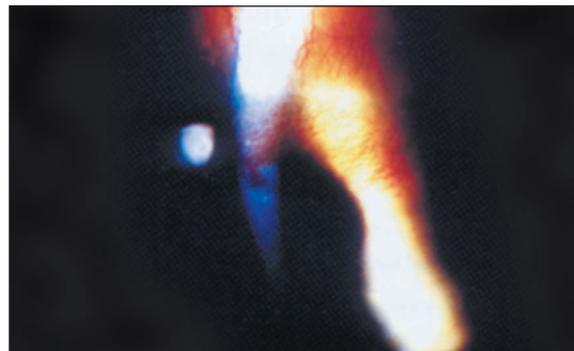
Hinge: Burn

### 1. Corneal section (Level I)



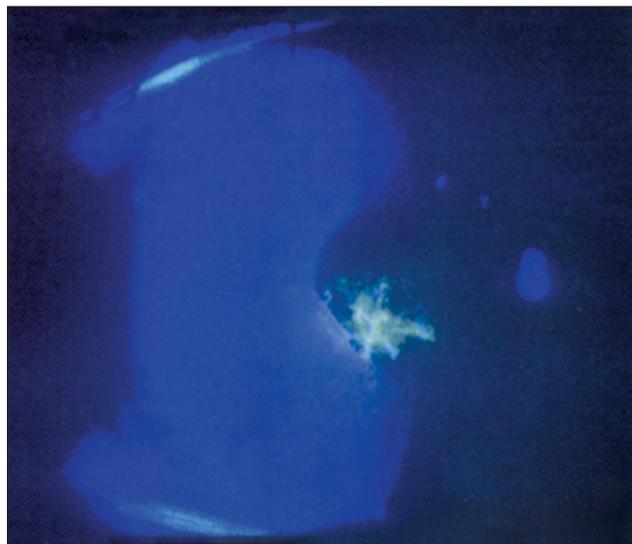
Lost Cap (Corneal)

### 2. Corneal Section (Level II)



Heme (Blood) in Interface

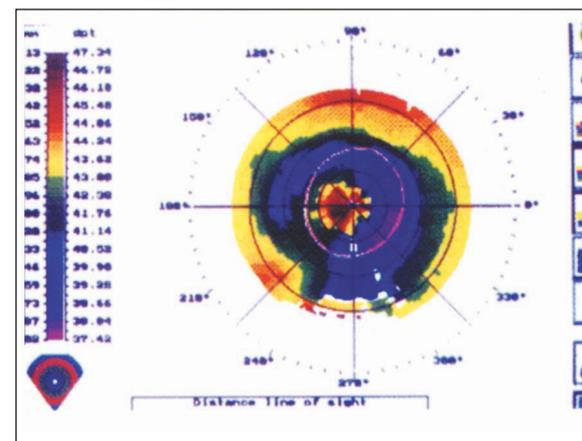




**Herpes Keratitis After LASIK**

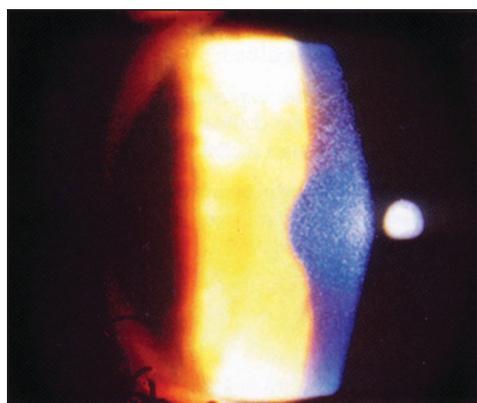


**Sutured Complete CAP**

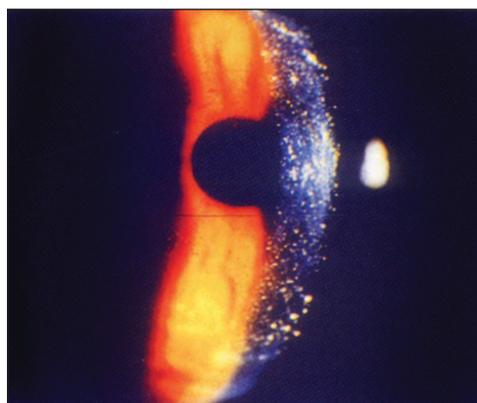


**Central Island**

**Level 2 (Interface):**  
**Epithelial Ingrowth**  
**Toxic Interfacitis**



**Toxic Interfacitis**



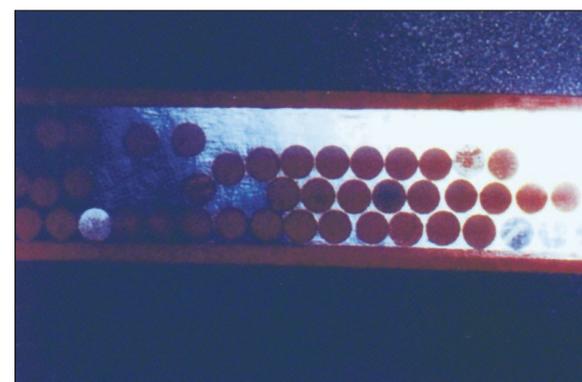
**Metallic Debris in Interface**

**Level 3 (Ablation Bed):**  
**Central Island**  
**Decentration**

The allocation of corneal complications of Lasik to the described three layers (tiers) has opened the door to a new way of understanding and analyzing the complications both, from a diagnostic as well as management point of view.

[Gulani AC. "Lasik Complications and Management Guides". Can Ophth Society meeting. Vancouver, June 2000] This also lays down the groundwork and initiative for further improving the existing corneal topography machines to provide more anatomically specific topographic information with respect to the affected layers rather than a summarized report of the entire anterior corneal surface.

Thus, once we recognize the complication to be at a specific layer in the corneal section we could attain layer-specific topographic information and thereby effectively manage that particular level without affecting the whole tissue component empirically.



**Beam Homogeneity Check.**  
**Aluminum Foil**

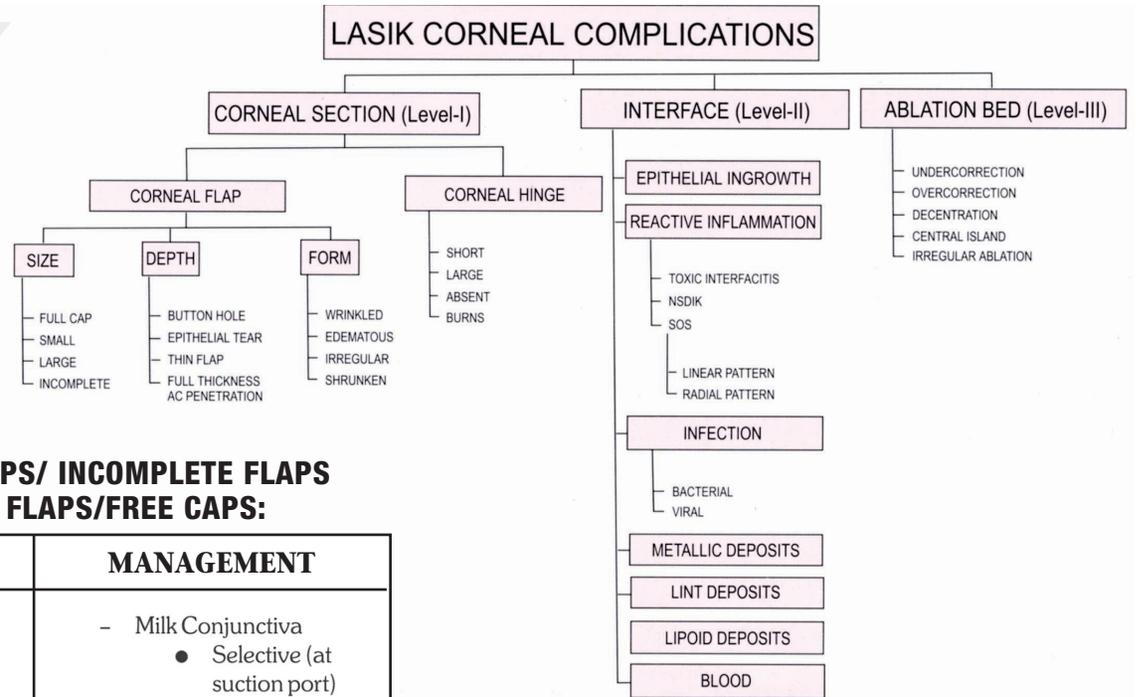
Microkeratome related complications are a sum total of meticulous unit assembly along with a steep learning curve. It has been undoubtedly proved that increased experience with the microkeratome is related to a decrease in the complications associated with the same. The complications associated with the use of the microkeratome in Lasik are tabulated below along with their management strategies.





## GULANI 3-TIER CLASSIFICATION

# LASIK



### BUTTON HOLES/EPITHELIAL TEARS/THIN FLAPS/ INCOMPLETE FLAPS IRRREGULAR FLAPS/LARGE FLAPS/SHORT FLAPS/FREE CAPS:

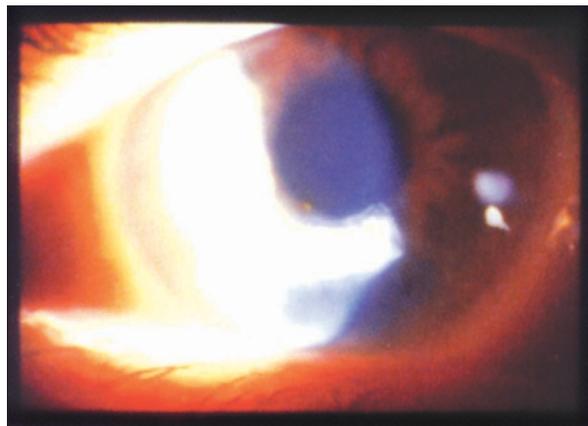
ETIOLOGY	CHECK	MANAGEMENT
<ul style="list-style-type: none"> <li>- Orbital access               <ul style="list-style-type: none"> <li>● Physio                   <ul style="list-style-type: none"> <li>- deep Socket</li> <li>- small palpebral aperture</li> </ul> </li> <li>● Patho                   <ul style="list-style-type: none"> <li>- S/P trauma</li> <li>- S/P Surgery</li> </ul> </li> </ul> </li> <li>- Microkeratome Gear Jam               <ul style="list-style-type: none"> <li>● Eyelashes/lid margin</li> <li>● foreign body/debris</li> <li>● speculum bar itself</li> </ul> </li> <li>- Irregular Corneal Shape               <ul style="list-style-type: none"> <li>● S/P PKP</li> <li>● S/P RK</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Suction               <ul style="list-style-type: none"> <li>● <b>Clinically</b> <ul style="list-style-type: none"> <li>● Pupil dilating</li> <li>● Visual blackout</li> <li>● Deepening of AC</li> </ul> </li> <li>● <b>Mechanically</b> <ul style="list-style-type: none"> <li>● Barraquer's Tonometer (&gt; 65 mm)</li> <li>● Digital feel</li> <li>● Ring-globe unity</li> </ul> </li> </ul> </li> <li>- Stopper advance &amp; microkeratome assembly</li> <li>- Corneal Ks' &amp; topography</li> <li>- IOP and suction hold</li> <li>- Orbit, lid margin and lash clearance</li> <li>- Corneal marks</li> </ul>	<ul style="list-style-type: none"> <li>- Milk Conjunctiva               <ul style="list-style-type: none"> <li>● Selective (at suction port)</li> <li>● Total</li> </ul> </li> <li>- Retrobulbar injection (avoid if possible)               <ul style="list-style-type: none"> <li>● Reschedule surgery</li> <li>● PRK (if within PRK range)</li> <li>● Post surgical lubricants</li> </ul> </li> <li>- Suture if necessary</li> </ul>

### EPITHELIAL INGROWTH

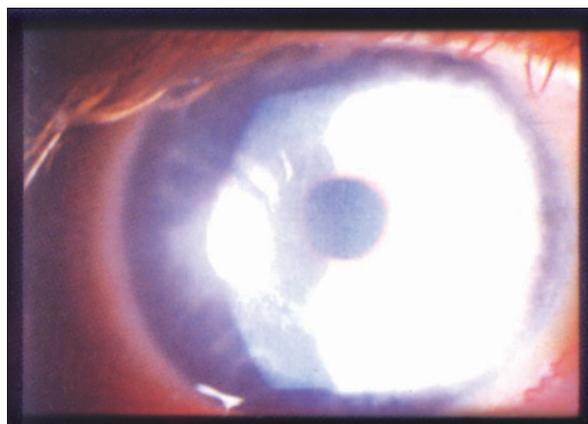
ETIOLOGY	CHECK	MANAGEMENT
<ul style="list-style-type: none"> <li>- Epithelial discontinuity i.e., Abrasion/button hole               <ul style="list-style-type: none"> <li>● Poor/inadequate edge alignment &amp; adhesion</li> <li>● Presence of incisions (old/new) on corneal flap i.e. previous RK</li> </ul> </li> </ul> <p>* Increased prevalence with Hyperopic stromal ablations</p>	<ul style="list-style-type: none"> <li>- Respect Epithelium</li> </ul> <p>Minimize preoperative topical anesthetics drops</p> <p>Minimize handling</p> <p>Alignment at edge followed by striae test</p>	<ul style="list-style-type: none"> <li>- Follow the management cascade:</li> </ul>

# EPITHELIAL INGROWTH





Epithelial Ingrowth, Pre-Cryotherapy,



Epithelial Ingrowth, Post-Cryotherapy, (1 Month)

### Diagnosing Epithelial ingrowth is not difficult, the decision of WHEN to intervene, is:

In order to address this concern and also with a desire to standardize the management protocol, I have proposed intervention criteria based on the qualification of Clinically significant epithelial ingrowth [Gulani AC. "New Criteria and Management Protocols for epithelial Ingrowth in Lasik". ESCRS. Amsterdam. Sept, 2001]. As per the proposed system, epithelial ingrowth is of clinical significance by three criteria ie. Visual, Tectonic and Progression criteria.

Having confirmed the Epithelial ingrowth to be Clinically Significant, the management can be designed based on Site and Extent of involvement.

Thus by the proposed protocol, focal growths in the center can be managed by the ND-YAG laser (Avalos G); Focal growths in the periphery, especially in the presence of previous Radial Keratotomy incisions (Where re-lifting the flap is dangerous since it may result in multiple pieces of

## EPITHELIAL INGROWTH

### The 2-3-4 Rule:

**Ingrown epithelium involves 2 kinds of tissue:**

1. Epithelium
2. Scariform tissue

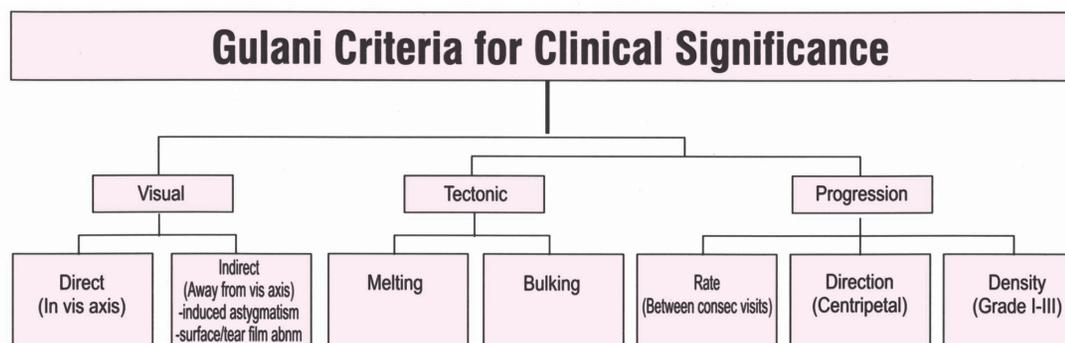
**Epithelial ingrowth requires 3 factors to present itself:**

1. Source of surface epithelium
2. Surface deficit: that is, abrasion, ulcer, epithelial defect, edge fistula, etc.
3. Space to grow into; such as the lamellar flap or pre-existing incisions in the cornea from radial keratotomy or other procedures, which allow epithelial cells to track along their path of least resistance.

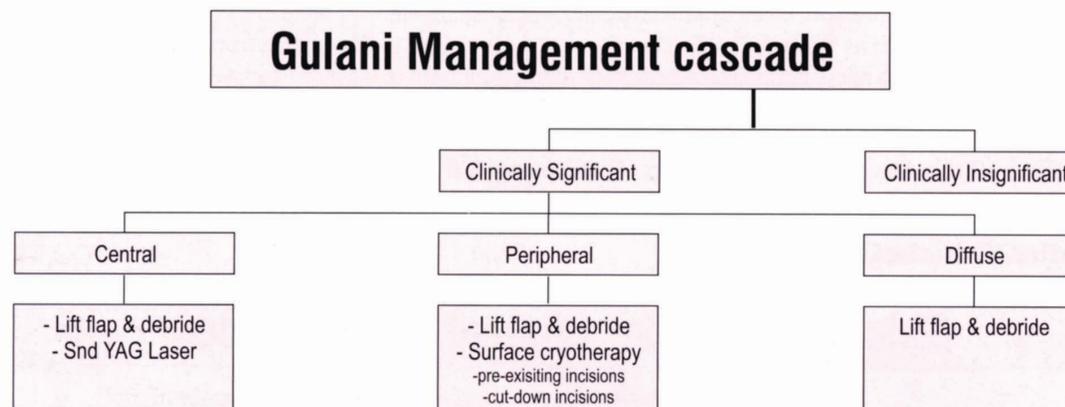
**Epithelial ingrowth involves 4 surfaces:**

1. Stromal bed
2. Underside of the corneal flap
3. Flap edge
4. Flap hinge

### Intervention Criteria Chart



### Management Protocol Chart



the corneal flap) can be treated with surface Cryotherapy wherein the incisions can be used to our advantage in milking out the epithelium. Re-lifting the corneal flap and debriding the epithelium is of course the most effective and definite way of removal of epithelial ingrowth keeping the **2-3-4 rule** in mind and addressing

the same. Here I'd like to add that partial or pocket dissection is not to be undertaken (Unless it only involves the periphery Imm of the flap) since it can cause the following problems:

1. Torque and Irregular astigmatism
2. Track for recurrence

